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Science

Think and Learn

2nd prep. First Term

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تم مصرح بتداول هذا الكتاب خارج وزارة التربية والتعليم والتعليم الفني



المقدمة

عزيرى التعميد / التعميد

يعد هذا الكتاب لأبنائنا التلاميذ الجيد الثاني الإعدادي. ونؤكد على أن تعلم العلوم عملية نشطة ومهمة ومثيرة للتفكير في تحديد الأنشطة العملية، وتصميم النماذج والأشكال والعدايات، وكتابة التقارير والبيانات البسيطة، والتفكير والتعلق من البيانات والمعلومات، وطرح الأسئلة والتأمل والتواصل، والقيام ببناء التفسيرات عن الظواهر الطبيعية، وتطبيق المعرفة في مواقف الحياة، وحل المشكلات من خلال التخطيط والتجريب والتعلم التعاوني. وهذه الإجراءات والمهارات هي التي يتناولها نتم العلوم الناتج على الاستكشاف والتعلم النشط، واستخدام مهارة التفكير العلمي والابتكاري أو الإبداعي والتفكير والتأمل.

وقد تم اختيار عنوان لهذا الكتاب بنفس فلسفته، وهو **فكر وتعلم**، وقد تم الاسترشاد في إصداره بأراء بعض المتخصصين في التفكيح وطرق تدريس العلوم والموجهين والمعلمين والتلاميذ. تأكيداً لفلسفة الكتاب وأسس بنائه وتطويره. وتم اعتماد فلسفة الكتاب في ضوء الكفايات القومية للتعليم والتربية العلمية.

ويهدف هذا الكتاب إلى مساعدة التلاميذ على إدراك العلاقة بين العلم والتكنولوجيا، وفهم تاريخ وتطبيقات العلم، وتسمية مهارات التفكير والمهارات الحياتية، والتعلم العلم العلوم للمفاهيم الأساسية، وتسمية الاتجاهات العلمية والقسم الاجتماعية لتطبيق التربية العلمية للمواطنة والحياة والعمل، من خلال الممارسة تفكير التلاميذ والاستفادة من مراكز ومصادر التعلم داخل المدرسة وخارجها، بالإضافة إلى توظيف استراتيجيات التعلم النشط والتعلم الذاتي والتعلم هذه الأهداف تم استخدام مداخل متنوعة في شكل وحدات وموضوعات دراسية مترابطة ومتكاملة مع بعضها ومع المواد الدراسية الأخرى.

ويتناول كتاب الفصل الدراسي الأول ثلاث وحدات، هي:

• **أولى التفسير والتوضيح** • **العلاقة الجيدة وحماية كوكب الأرض**

• **الحفاظ على وحماية التنوع من التغير**

ونحن إذ نقدم هذا الكتاب نرجو الله أن يحقق الفائدة منه.

والله ولي التوفيق.

الإيمان

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Unit 1

Periodicity of Elements and their Properties

Lessons of the unit

Lesson 1 : Attempts of elements classification.

Lesson 2 : Graduation of elements properties in the modern periodic table.

Lesson 3 : Main groups in the modern periodic table.

Lesson 4 : Water.

Sources of knowledge and learning

• Books and scientific encyclopedia

❶ Great Law in Chemistry

Mare House

❷ Easy Chemistry Dorothy Paul

Lebanon Bookshop

❸ Water

Family Bookshop

❹ Water Steve Parker

El Farouk House

Learning objectives of the unit

At the end of this unit , the student should be able to :

- 1 Follow the efforts and attempts of some scientists to classify elements (Mendeleev - Moseley - Modern Periodic Table)
- 2 Recognize the principles of elements classification in the modern periodic table.
- 3 Estimate scientists efforts in discovering , classifying and investing elements.
- 4 Determine the location and properties of some elements in the modern periodic table by recognizing their atomic numbers.
- 5 Compare the properties of groups and periods in the modern periodic table.
- 6 Compare between metals, nonmetals , semimetals and inert gases in their electronic configuration and chemical activity.
- 7 Describe main groups in the modern periodic table.
- 8 Describe elements properties and their uses.
- 9 Use tools, materials and instruments in studying elements properties.
- 10 Recognize the importance of water and its sources.
- 11 Determine the chemical and natural properties of water.
- 12 Explain the irregularity of the natural properties of water.
- 13 Describe the chemical bonds among the atoms and molecules of water (covalent and hydrogen)
- 14 Recognize the polarization of some chemical compounds (Water-Ammonia)
- 15 Recognize the electrolysis of water.
- 16 Explain the equivalence of water.
- 17 Describe how water reacts with some of the elements of chemical activity series.
- 18 Determine water pollutants and their bad effects.
- 19 Determine the methods and measures for protecting water from pollution.
- 20 Estimate the importance of water locally and internationally.
- 21 Determine his/her personal responsibilities to protect water from pollution.
- 22 Make needed decisions to protect water from pollution.

Lesson 1

Attempts of Elements Classification

Lesson objectives

At the end of this lesson, the student should be able to :

- 1 Recognize the efforts of some scientists to classify elements.
- 2 Recognize the principles of elements classification in the modern periodic table.
- 3 Determine the location of some elements in the modern periodic table by recognizing their atomic numbers.
- 4 Deduce the atomic numbers of some elements by recognizing their locations in the modern periodic table.
- 5 Estimate the importance of discipline and organisation in our life.
- 6 Estimate scientists efforts in discovering, classifying and investing elements.

Points of the lesson

- 1 Mendeleev's periodic table.
- 2 Moseley's periodic table.
- 3 Modern periodic table.

Included cases

- 1 Investment of environmental elements and raw materials.
- 2 Discipline and organisation.
- 3 Scientific research and its importance in discovering elements.



- Many attempts are made by scientists for classification of elements to be easily studied, and find the relation between elements and their physical and chemical properties. Mendeleev's periodic table is considered as the first real periodic table for classification of the elements.



Discovering the periodicity of the properties of elements.

Share with your classmates in co-operating groups and arrange the circles in front of you according to their colours and the graduation of their numbers in the four vertical columns in the table.

Table (1)

	Column 1	Column 2	Column 3	Column 4
Row 1				
Row 2				
Row 3				



Observations :

- What do you observe about the graduation of numbers in the circles in each horizontal row ?
.....
 - What do you observe about the repetition of colours of circles in the horizontal rows ?
.....
- The activity you did, doesn't differ from what the Russian Scientist Mendeleev did. In 1871, Fig. (1), he recorded on single cards: the names of the elements, their atomic weights and their important properties. He arranged the similar elements in vertical columns called "groups" later. He discovered that the elements were arranged in an ascending order according to their atomic weights from left to right in the horizontal rows, which were later called "periods" and their properties are periodically repeated at the beginning of each new period. Mendeleev explained his periodic table in his book "Principles of Chemistry" In 1871, and classified the known elements until this time to be (67) elements, and he also classified each main group into two subgroups (A, B) where he found differences between their properties.



Mendeleev
Fig. (1)



Enrichment information (1)

- Some elements have many forms having the same atomic numbers but differ in atomic weights which known as "Isotopes".
- Read and collect information about Scientist Mendeleev.
(Use magazines, encyclopedias and the internet).

Advantages and disadvantages of Mendeleev's table.

Mendeleev predicted the ability of discovering new elements. So he left spaces (empty cells) in his table, and he corrected the wrong estimated atomic weights of some elements. He had to make a disturbance in the ascending order of atomic weights for some elements, due to putting them in groups which suit their properties, and he also would have to deal with the isotopes of one element as different elements because they are different in their atomic weights.

Enrichment information (2)

In 1871, Mendeleev predicted the properties of an unknown element and named it ICA silicon that was named germanium (Ge) and its properties was the same as Mendeleev had predicted.

Self Inquiry

Did you ask yourself: Why did he put more than an element in one place?

Communication

Discuss with your classmates under the supervision of your teacher about advantages and disadvantages of Mendeleev's periodic table.

Moseley's periodic table

In 1913, the Newzealand Scientist Rutherford discovered that the nucleus of atom contains positively charged protons, the British Scientist Moseley discovered in the same year after studying the properties of x rays that the periodicity of elements properties is related to their atomic number not their atomic weights as Mendeleev believed.

So Moseley rearranged the elements in an ascending order according to their atomic number such that the atomic number of an element increases by one than the element

Enrichment information (3)

- From the discoveries which have helped Moseley to put his periodic table are :
 1. Radiation activity phenomena.
 2. Getting of x-rays.
 3. The more knowledge about the arrangement of electrons in atoms.



before it in the same period, and he added the inert gases in the (0) zero group, and he located a place below his periodic table for the two groups lanthanides and actinides.

Exercise (1)

What is the scientific principle on which the classification of the elements based on ?

- Mendeleev's periodic table:
- Moseley's periodic table:

The modern periodic table

After the Danish Scientist Bohr discovered the main energy levels fig. (2). They are 7 in the known heaviest atom so far. It was discovered also that each main energy level consists of a number of energy levels known as the energy sublevels.

- Elements are classified in the modern periodic table according to:
- Their atomic numbers and the way of filling the energy sublevels with electrons.



Fig. (2)

Enrichment Information (4)

Each main energy level contains a number of energy sub-levels equal to its number.

For example the main fourth energy level N consists of four energy sub-levels which are s, p, d and f.

Periodic elements

										He Helium 2
										Ne Neon 10
										Ar Argon 18
										Kr Krypton 36
										Xe Xenon 54
										Rn Radon 86
										Uuo

Eu Europium 152	Gd Gadolinium 157.25	Tb Terbium 158.93	Dy Dysprosium 162.50	Ho Holmium 164.93	Er Erbium 167.26	Tm Thulium 168.93	Yb Ytterbium 173.05	Lu Lutetium 174.97
Am Americium 243	Cm Curium 247	Bk Berkelium 247	Cf Californium 251	Es Einsteinium 252	Fm Fermium 257	Md Mendelevium 258	No Nobelium 259	Lr Lawrencium 260

Alkali metals

Alkaline earth metals

Lanthanides

Actinides

Transition metals

Poor metals

Metalloids

Nonmetals

Halogens

Noble gases

State at standard temperature and pressure

Atomic number in red: gas

Atomic number in blue: liquid

Atomic number in green: solid

solid border: at least one isotope is older than the Earth (Primordial isomer)

dashed border: at least one isotope definitely older than decay of stable chemical elements and its isotope is older than the earth

stuffed border: only artificially made isotopes (synthetic elements)

up (border): unobserved

Description of the modern periodic table



Description of the modern periodic table

Participate with your classmates in forming co-operating groups for studying the modern periodic table and record observations for the following questions.

1. Name the horizontal rows of the periodic table.

2. What are the groups of s block?

3. What are the groups of p block?

4. Write the names of the blocks of the periodic table.

And what is number of vertical columns in it?

And what is number of vertical columns in it?

5. Write the names of the groups of the periodic table.

6. Write the names of the groups of the periodic table.

7. Write the names of the groups of the periodic table.

From studying the modern periodic table

The number of known elements until now are 118 elements. 92 elements are abundant in the earth's crust, the rest of the elements are prepared artificially.

Elements of (A) groups lie on the left and right of the table. you can locate their position in the modern periodic table by knowing their atomic numbers and vice versa.

The elements of (B) groups lie in the middle of the table. Starting From The Fourth Period and including 10 Groups Known as transition elements.

Enrichment information (5)

Recently discovered elements are not found in nature but they are prepared artificially.

These elements are radioactive elements, their nuclei are decayed in less than a second.

Use Excel Program in drawing a table that explains periods and groups of periodic table.

Exercise (2)

Mention the kind and the block of the element, which is located in group 18 and fourth period.

Life application House library

Form a bookstore at your home (Use Family Library - school library).
Apply what you have studied about the elements classification in arranging them in horizontal rows and vertical columns including the subject of the book (scientific, historical, religious, ...) and making an index for the books to facilitate the search process.



Home library



Determination of the position of the element in the periodic table by knowing its atomic number

Participate with your classmates in the co-operating group to do the following activity

Steps:

- 1 Write the atomic number of the element in the box below.
- 2 Write the number of the period in the box below.
- 3 Write the number of the group in the box below.

Element	$_{20}\text{Ca}$	$_{15}\text{P}$	$_{10}\text{Ne}$	$_{1}\text{H}$
Electronic configuration				
Energy levels				
Number of period				
Number of electrons in outermost energy level				
Number of group				

Check your understanding

- 1 What is the relationship between the number of energy levels occupied by electrons in the atom of the element and its period number?
- 2 What is the relationship between the number of electrons in the outermost energy level of the atom of the element and its group number?

Remember

- 1 Number of period of the element = Number of energy levels occupied by electrons in its atom
- 2 Number of the group of the element = Number of electrons in the outermost energy level in its atom

Exercise (3)

Classify the elements into two groups

1 2 3 4 5 6



Determination of the atomic number of the element by knowing its location in the periodic table

Participate with your classmates in the co-operating groups to do the following activity

Step 1

- 1 Write down the atomic number of the element in the table below by knowing its period number
- 2 Write down the atomic number of the element in the table below by knowing the number of its group
- 3 Write down the atomic number of the element in the table below by knowing the number of its group
- 4 Write down the atomic number of the element in the table below by knowing the number of electrons

Check Your Learning

- 1 What is the atomic number of F and Ar?

- 2 Write the electronic configuration of the following elements.

- 3 Complete the following table.

Table 8

Group	SA	CA	A	0
Period	N	O	F	Ne
Second period				
Third period	P	S	Cl	Ar

Check Your Understanding

- The atomic number of an element = Sum of the number of electrons which rotate around the nucleus of its atom and also = The number of protons in the nucleus.
- The atomic number of an element is a whole number increasing through periods from one element to the following element by (1).



A case for discussion

Development of scientific and life concepts

- 1 The classification of elements passed several stages, each of them tried to avoid the mistakes of its predecessors and benefitted from the newly established theories, experiences and scientific results.

Discuss this issue with your classmates under the supervision of your teacher. These questions should be a part of the subject of discussion.

- 2 Is what you believe in today will remain for ever in your mind?

Which do you prefer to complete your tasks and scientific researches: individual work or group work? Why?

From where do you gain your experience: your personal experiences or the experiences of others?

Is there a relationship between the development of scientific concepts and societal changes?

Lesson summary

Classification of elements

Mendeleev's periodic table

Elements are arranged ascendingly according to their atomic weights.

Moseley's periodic table

Elements are arranged ascendingly according to their atomic numbers.

Modern periodic table

Elements are arranged ascendingly according to their atomic numbers and the way of filling the energy sublevels with electrons.

7 horizontal periods and 18 vertical groups

Blocks of elements

f block

d block

p block

s block

- Each main energy level contains a number of energy sublevels.
- Transition elements start to appear in the fourth period.
- Number of period of the element = Number of energy levels occupied by electrons.
- Number of group of the element = Number of electrons in the outermost energy level in its atom.



1 Complete

Mendeleev arranged the elements ascendingly according to atomic weight while Mosley arranged them ascendingly according to atomic number.

The modern periodic table consists of 7 horizontal periods and 18 vertical groups.

2 What is the scientific base in which the modern periodic table classified?

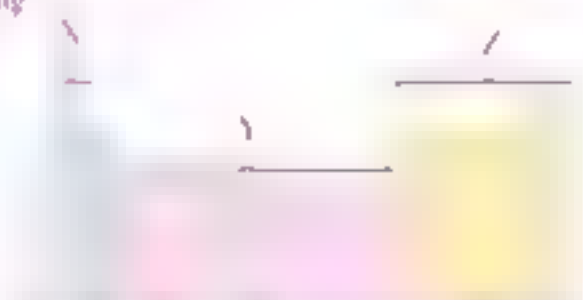
3 Locate the position of the following elements in the modern periodic table

${}^1_1\text{H}$	$(11)_1\text{Na}$
${}^{18}_{18}\text{Ne}$	$(19)_{19}\text{K}$
${}^{36}_{36}\text{Kr}$	$(18)_{18}\text{Ar}$

4 Find the atomic number for the following elements

- Element X lies in the first period and zero group
- Element Y lies in the second period and 5A group
- Element Z lies in the third period and 7A group

5 Name the blocks in the periodic table and answer the following



What are the names of blocks which are characterized by the letters X, Y, and Z?

6 What is the number of groups in each block?

X	Y	Z
2	6	10

What is the number of 7A group and zero group?

6 Study the opposite figure which

Li	Be	B	C	N	O	F	Ne
Na	Mg	Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru
Cs	Ba	La	Hf	Ta	W	Re	Os



- ☐ The same period
- ☐ The same group

7 Creative Thinking

Imagine a new form of classification of elements which their atomic numbers range between 20 such that each group contains similar elements.



Search in your school library or internet for the attempts which precedes Mendeleev's attempt for classification of elements.

Lesson 2

Graduation of Elements in the Modern Periodic Table

lesson objectives :

- 1 Determine the properties of some elements by knowing their atomic numbers
- 2 Compare between some elements according to the electronic configuration and the chemical activity
- 3 Identify metals, nonmetals and metalloids
- 4 Compare between the properties of the groups and the periods of the periodic table
- 5 Identify the polarity of some chemical compounds
- 6 Identify the behaviour of some metals of the chemical activity series with water
- 7 Use tools and substances discovering the chemical properties of metals and nonmetals

Points of the lesson

- 1 Atomic size property
- 2 Electronegativity property
- 3 Metallic and nonmetallic property
- 4 Chemical activity series
- 5 Chemical properties of metals
- 6 Chemical properties of nonmetals

- 1 Using of the elements and environmental resources
- 2 Graduation of responsibilities of both personal and social decisions
- 3 Integration of responsibilities and roles

- 2 This lesson discusses the graduation of some elements properties in the periods and the groups (A) in the periodic table and the relation between these properties and the electronic configuration of elements.

3 Atomic size property

The atomic size is determined by knowing the atomic radius and measured in picometer = $\times 10^{-12}$ m



Discovering of the graduation of atomic size in the periodic table

Think carefully with your colleagues in the co-operating group (figure 1) and record your observations on the following questions

What do you observe for the graduation of

1. Atomic size in the periodic table

2. Atomic size in the periodic table

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99. Atomic size in the periodic table

100. Atomic size in the periodic table



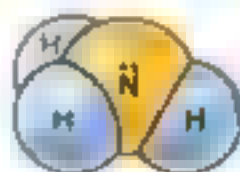
1. 10^{-12} = part of a million of a million of metre

From the previous, we conclude that

- The atomic size of the same period decreases by the increase of their atomic numbers. Due to the increase of the attraction force between positive nucleus and the electrons in the outermost energy level.
- The atomic size of the same group increases by the increase of their atomic numbers due to the increase of the number of the energy levels in the atoms.

3 The electronegativity property

It is defined as the ability of the atom in the covalent molecule to attract the electrons of the chemical bond towards itself, as that of water molecule and ammonia molecule that are known as a "polar compounds".



Polar ammonia molecule



Polar water molecule

Fig. 2
Figure (2)

The Polar Compound is a Covalent Compound where The difference in electronegativity between its elements is relatively large

Self Inquiry

Did you ask yourself about the relationship between the electronegativity and the polarity of some compounds like CH_4 methane gas, H_2S hydrogen sulphide?

Communication

Discuss with your classmates and your teacher the owner of classification idea into metals and nonmetals

the covalent bond is described as pure when the electronegativity difference between the two joined atoms equal zero.
What is the kind of covalent bond in oxygen molecule?

3- The metallic and nonmetallic properties

Elements are divided into 4 main kinds which are:

- Metals
- Nonmetals
- Semi-metals (Metalloids)
- Inert gases

Metals are characterized by that the outermost shells contain less than 4 electrons and tend to lose these electrons during the chemical reaction. They reach the nearest inert gas preceding them in the periodic table, forming positive ions.

• $\text{Na} \rightarrow \text{Na}^+ + e^-$ $\text{Ca} \rightarrow \text{Ca}^{2+} + 2e^-$ $\text{Al} \rightarrow \text{Al}^{3+} + 3e^-$ $\text{Fe} \rightarrow \text{Fe}^{2+} + 2e^-$ $\text{Cu} \rightarrow \text{Cu}^{2+} + 2e^-$ $\text{Ag} \rightarrow \text{Ag}^+ + e^-$ $\text{Au} \rightarrow \text{Au}^+ + e^-$

• $\text{W} \rightarrow \text{W}^{6+} + 6e^-$ $\text{Pt} \rightarrow \text{Pt}^{2+} + 2e^-$ $\text{Ni} \rightarrow \text{Ni}^{2+} + 2e^-$ $\text{Co} \rightarrow \text{Co}^{2+} + 2e^-$

What is your explanation?

Q1- Some elements have both properties of metals and non-metals which are known as metalloids

Like Boron - Silicon - germanium - Arsenic - Antimony - Tellurium



Discovering the graduation of the metallic and nonmetallic properties in the periodic table

1- Colour of the metal or nonmetal extracted from the periodic table

- Metals with red colour
- Semi-metals with yellow colour
- Nonmetals with green colour
- Inert gases with blue colour

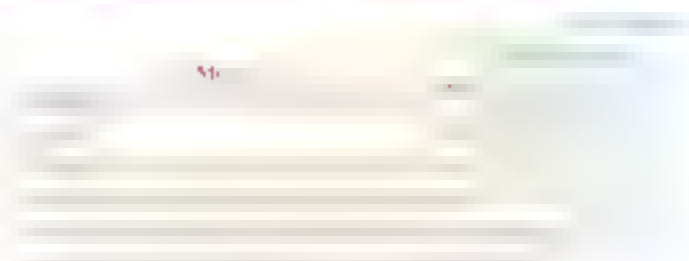


Figure 1

Recall the following questions:

- ❑ What is the kind of the element by which the period starts?
- ❑ What is the kind of the element by which the period ends?
- ❑ What is the kind of element which precedes the inert gas in each period?

Explain the periodic properties of elements:

- ❑ The period starts with strong metal, as the atomic number increases in the same period the metallic property decreases gradually until we reach semimetals and then nonmetals start appear and as the atomic number increases the nonmetallic property increases until we reach the strongest nonmetal in group 7A.

Metallic property of the same group increases by the increase of the atomic number as we go from up to down (as in group 1A) due to the increase of the atomic size, while nonmetallic property decreases (as in group 7A).

Exercise (1)

Classify the elements of the third period in the periodic table according to their kinds. Use the modern periodic table fig. (3) on page (10, 11).

The chemical properties of metals

To know the chemical properties of metals participate with your classmates in the co-operating group under the supervision of your teacher to do the following activity.



Discovering the chemical properties of metals

Substances and tools:

- Magnesium strip.
- Water
- A jar filled with oxygen
- Test tube
- Dilute hydrochloric acid.

Steps:

- ❶ Put a piece of magnesium strip in the test tube, then add the dilute hydrochloric acid.
- ❷ Heat another piece of magnesium strip till glowing and put it in the jar filled with oxygen fig. (4).
- ❸ Add some water to the jar with shaking.



Burning of magnesium in oxygen

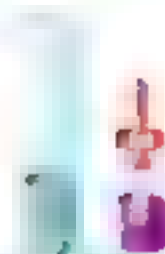
Figure (4)

LESSON 2

Objectives

1. Do magnesium react with the acid? How can you detect?
2. Does magnesium oxide dissolve in water?

What is the effect of adding violet litmus to the solution fig (5)?



The effect of adding violet litmus to magnesium oxide solution
Figure 12.

Chemical Equations

1. Some metals react with dilute acids forming salt of acid and hydrogen gas fig (6).

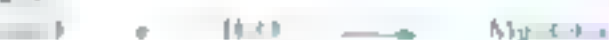


magnesium reacts with hydrochloric acid
Figure 13.

2. Metals react with oxygen forming metallic oxides which are known as basic oxides.



3. Basic oxides which dissolve in water are called alkalis.



A mixture of MgO , MgCl_2 and H_2O is making stones for making blades of knives which are very thin (Sharpening knives).

- Metals are arranged descendingly according to their Chemical activity known as **activity series**, the chemical activity of metals with water is different according to their position in the series as shown in the table (1).

K Potassium and Na Sodium	React instantly with water and H_2 evolves which burns with a pop sound
Ca Calcium and Mg Magnesium	React very slowly with cold water
Zn Zinc and Fe Iron	React in high temperature with water vapor only
Cu Copper and Ag Silver	Don't react with water

High concentration of sodium ions Na^+ in the body causes high blood pressure so high blood pressure patients are recommended to decrease using table salt in foods.

Read and collect information about the importance of the different elements in food.

Life application Cleaning silver tools

Cover the bottom of a plastic plate with an aluminium paper (foil), whereas the bright surface is upward.

Put on the aluminium paper the silver tools which you want to clean.

Cover them by enough boiling water and then put 1 spoon of baking powder.

- Leave the tools for 15 minutes with stirring.
- Dry the tools after rinsing them with hot water.



cleaning silver plate
Figure 4

Thinking and problem solving

1. Know the chemical properties of nonmetal elements. Participate with your classmates under the supervision of your teacher to do the following activity.



Discovering the chemical properties of nonmetals

Substances and tools

- Two pieces of coal (carbon)
- Two test tubes
- Dilute hydrochloric acid
- Burning spoon
- A jar filled with oxygen

Steps

- 1 Put a piece of carbon in the test tube. Then add dilute HCl to it.
- 2 Heat the other piece of carbon in the burning spoon till it burns, then put it in the oxygen jar (fig. 6).
- 3 Add some water in the jar with shaking.

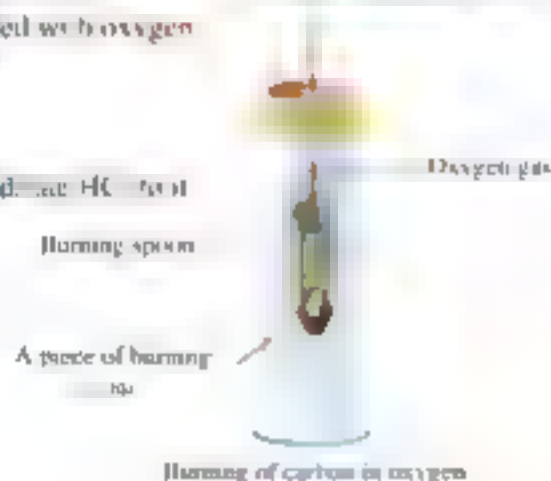


Figure 6

LESSON 2

Observation:

1. When a metal reacts with an acid, a gas is evolved which turns lime water milky.
2. When a non-metal reacts with an acid, a gas is evolved which turns potassium dichromate paper orange.

Figure (9)

Conclusion:

- Nonmetals don't react with acids.
- Nonmetals react with oxygen forming non-metal oxides. Most of them are known as acidic oxides.



- The non-metal oxide dissolves in water forming acids.



The effect of adding violet litmus solution to the acidic solution.

Figure (9)

Some element oxides like aluminum oxide Al_2O_3 are called amphoteric oxides because they react with acids as basic oxides react with bases as acidic oxides and give in both cases salt and water.

Lesson summary

Graduation of the elements properties in the periodic table

Increases by increasing the atomic number in the same group

Atomic size

Decreases by increasing the atomic number in the same period

Increases by increasing the atomic number in the same group

Metallic property

Decreases by increasing the atomic number in the same period

Electronegativity

Polar compounds as water

Electronegativity Is the ability of an atom in the covalent compound to attract the bonded electrons to itself

Water and ammonia are from the category of polar compounds

The properties of semi-metals look like the properties of both metals and nonmetals

Periodic law Is the descending arrangement of elements according to their chemical activities



1 Fill in the blank with the correct answer

The atomic size increases by the increase of the atomic number ()

Water and ammonia are from polar compounds ()

Some alkalis dissolve in water forming bases. ()

The solutions produced from dissolving the non-metal oxides in water turn the violet litmus solution into red ()

2 Choose the correct answer between brackets

Each period in the modern periodic table starts with _____ element
(metallic - semimetallic - nonmetallic - inert)

When sodium reacts with water, _____ gas evolves. (O_2 - CO_2 - H_2 - N_2)

LESSON 2

3 What is meant by . . .

1) Metalloids

Chemical activity series

4 Fe Zn Cu H Ag H₂ Au

Iron

(3) Silver

(1) Potassium

7 A S Fe H₂ Cl₂ S P O

1) Carbon dioxide with water

2) Magnesium with dil. hydrochloric acid

Lesson 3

The Main Groups in the Modern Periodic Table

Lesson objectives :

- 1 Determine the valency of alkali metals.
- 2 Describe the behaviour of alkali elements in the chemical reactions.
- 3 Deduce the general properties of alkali metals.
- 4 Determine the valency of alkali Earth metals.
- 5 Describe the behaviour of alkali Earth metals in chemical reactions.
- 6 Deduce the general properties of alkali Earth metals.
- 7 Compare between the properties of alkali metals and alkali Earth metals.
- 8 Define halogen group.
- 9 Deduce the general properties of halogens.
- 10 Appreciate the importance of alkali metals and alkali Earth metals in our life.
- 11 Describe the properties of elements and their uses.
- 12 Appreciate the role of scientists and their efforts in studying elements and their uses in our life.

Points of the lesson

- 1 Alkali metals group.
- 2 Alkali Earth metals group.
- 3 Halogen group.
- 4 Inert gases group.
- 5 Properties of elements and their uses.

Included cases :

- 1 Making use of elements, resources and environmental ones.
- 2 Appreciating the role of science, scientists and scientific research in our life.

LESSON 3

- Some of the main groups in the periodic table are characterized by Specific names as explained in this lesson.

Description of some groups.

1. Alkali metals group (Group 1A) →

Observe and think carefully about the position of alkali metals in the periodic table (Fig 1) group 1A lies in the maximum left in the periodic table (Fig 2) and these metals are named alkali metals because they react with water forming alkali solutions.



The place of the alkali metals group in the periodic table.

Li 1 Lithium
Na 11 Sodium
K 19 Potassium
Rb 37 Rubidium
Cs 55 Cesium
Fr 87 Francium

Alkali metals

- What is the block of elements of group (1A)?
- What is the valency of alkali elements?
- What is the behaviour of the alkali elements atoms in the chemical reactions?
- Do alkali metals conduct heat and electricity?

Identify the other properties of alkali metals.

participate with your classmates under the supervision of your teacher to do the following activity

Although hydrogen gas exists in group 1A, it is a nonmetal because its atom is remarkably small and it is a gaseous element.

Search for the other similarities between hydrogen, metals and nonmetals.



Discovering the properties of alkali metals

Substances and tools →

- A piece of sodium
- A piece of potassium
- Filter paper
- Basin
- Water

Steps:

- 1 Take out a sodium piece (pea size) from the kerosene in which sodium is kept. fig. (3)
- 2 Roll the sodium piece on the filter paper and put it carefully in the water basin.
- 3 Repeat the previous steps with potassium.



Observations:

- 1 Why are Na and K kept under kerosene?
 - 2 Which is stronger when reacting with water Na or K?
 - 3 Do Na and K float on the surface of water or sink in it.
- From the previous, we can deduce the general properties of alkali metals as follows.

Lithium is not kept under kerosene because it floats on the surface of it and it is immediately burnt so it is kept in paraffin oil.

General properties of alkali metals

- 1 They are monovalent elements because their outermost shells contain (1) electron.
- 2 They tend to lose their valency electron forming positive ions that carries one positive charge.
- 3 They are chemically active elements so they are kept under kerosene or paraffin to prevent their reaction with the moist air.
- 4 Their chemical activity increases by the increase of atomic size. Cesium (Cs) is considered as the most active metal in general.
- 5 They are good conductors of heat and electricity.
- 6 Most of them have low density fig (5).



Reaction of K with H_2O



Reaction of Na with H_2O

Exercise (1)

From figure (6) mention the names of metals which sink and the metals which float on the surface of water, knowing that the density of water is 1 gm/cm^3

Density
 gm/cm^3

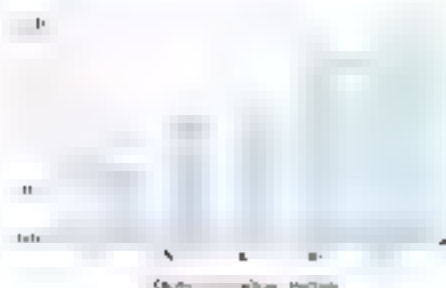
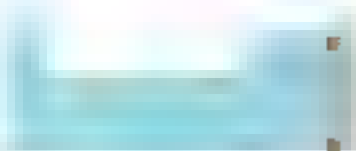


Figure 6

2 Halogens group (7A)

Observe and think carefully about the position of halogens group in the periodic table (Fig 7), the group 7A lies on the right side of the periodic table it is one of p-block groups. The nonmetals of this group are called halogens (Fig 8)



Location of halogens group in the periodic table

Figure 7

16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

metals forming salts



Halogen elements

Figure 8

Chlorine is used in the manufacture of correction substance. it is a very volatile liquid. on using, it becomes dry quickly, leaving a white substance on the paper surface



Figure (9)

General properties of halogen elements

- 1 They are mono-valent nonmetals ... Why?
- 2 They exist as diatomic molecules F_2 , Cl_2
- 3 They are chemically active elements so they do not exist individually in nature but they exist in chemical compounds except astatine which is prepared artificially
- 4 Each element in the group replaces the element below it in their solutions



- 5 The physical state is graduated from the gaseous state (Fluorine, Chlorine) to the liquid state (Bromine) to solid state (Iodine)

Exercise (2)

Write the equation of the reaction of Chlorine with sodium bromide

The properties of elements and their uses

The uses of elements or their compounds depends on their properties. You have studied before some of traditional uses for known elements. Now you will know the uses of some elements in the modern techniques.

- 1 Sodium is used in liquid state as it is a good conductor of heat. It is used also in transferring heat from inside the nuclear reactor to outside to obtain vapour energy required to generate electricity (Fig. (6))
- 2 Silicon chips are used in manufacturing of computers because they are semi-conductors which heat conductivity of electricity depends on the temperature.
- 3 Liquefied nitrogen is used in preservation of the cornea of the eye because it has a low boiling point ($-196^\circ C$)
- 4 The radioactive cobalt 60 is used in food preservation because gamma rays which come out from it prevent the reproduction of microbial cells without an effect on human.

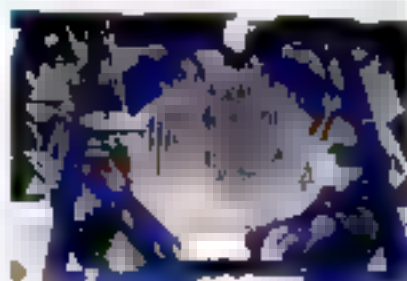


Fig. (6) Nuclear reactor

Figure (6)



Silicon chip

Figure (7)

The Egyptian Scientist Dr. Mustafa El-Sayed got the highest American medal in science for his efforts in the Nano technology in 2011 September. NNTK (Nanot) applying this technology in using gold in the treatment of cancer disease.



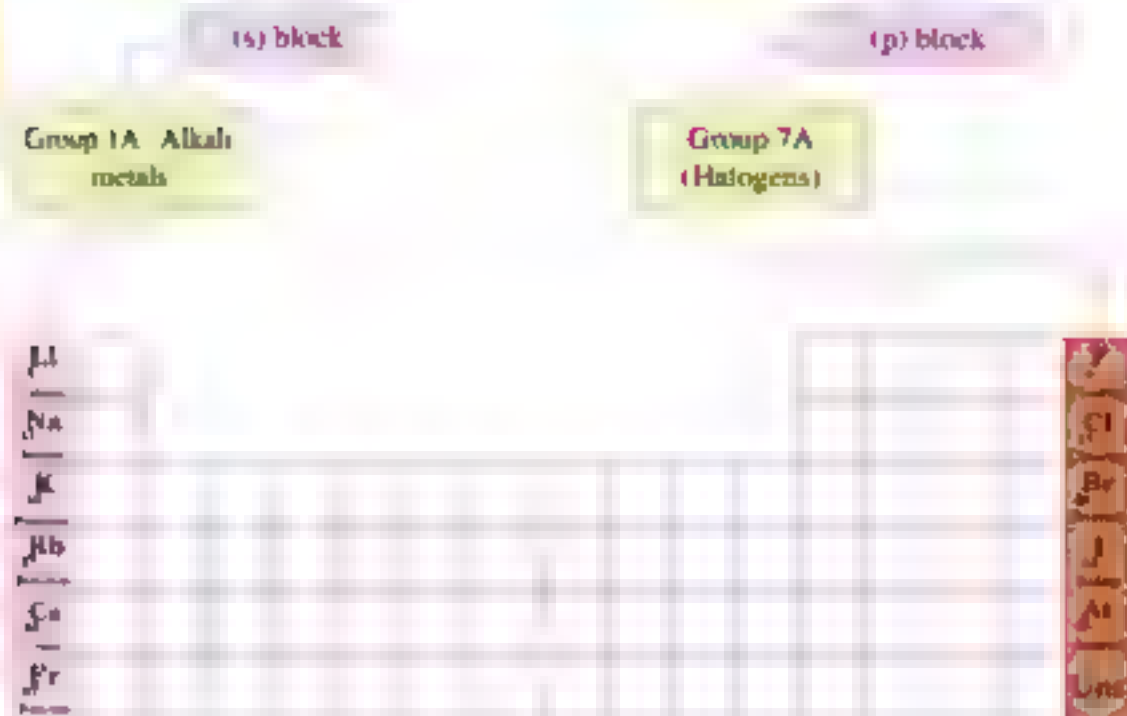
Dr. Mustafa El-Sayed



Nucleic acid hybridization of nucleic acids by gamma rays
Figure 1'

Lesson summary

Some of the main groups in the modern periodic table



- Alkali metals are mono-valent
- In halogen group each element replaces the element which below it in its salt solution



1 Choose the correct answer between brackets

is considered from halogen (Sodium Chlorine Helium Calcium)

(*) **..... in MS salt solution**

(Chlorine replaces bromine. Bromine replaces fluorine. Iodine replaces chlorine. Iodine replaces fluorine.)

 **Curve diameter fast**

Elements of group (1A) are known as alkali metal

Liquefied nitrogen is used in preservation of cornea of the eye

1. *Journal of the American Medical Association*, 1997; 277: 1039-1043.

(1) What is the symbol which indicates the

(b) Alkali metals.

Flakings

What is the symbol which represents

the most active metal'

‘the most active nonmetal’

A									J	K	L	N
B	O	E	P	G	I	M						

the letters in the table don't represent the actual symbols of the elements.

1. Liquid sodium

1.3. Solution

```
(*) Cobalt m) -+-----
```

5. $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

represent all elements (100%)

A male octopus

† July 1950

Element (symbol)	Behaviour with water	Physical state	Electric conduction	Density (gm. cm ⁻³)
X	dissolves	gas	bad conductor	1.000
Y	react	solid	good conductor	3.59
Z	react instantly	solid	good conductor	0.86

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Why lithium is not kept under kerosene but it is kept under paraffin oil?



Activity

2222222222222222

By help of scientific references in your school library or peering at the internet to compare between alkali metals, halogen from point of (atomic size, electronegativity, density, boiling point, melting point, atomic mass).

Lesson 4

Water

Lesson objectives

At the end of this lesson, the student should be able to:

- 1 Identify the bonds between its atoms and water molecules
- 2 Identify the physical and chemical properties of water
- 3 Explain the abnormality of physical properties of water
- 4 Identify the electrolysis of water
- 5 Explain why water is neutral.
- 6 Identify the water pollutants and their sources
- 7 Identify how to keep water from pollution
- 8 Appreciate the importance of water in our life

For this lesson, the student should:

- 1 Structure of water
- 2 Properties of water
- 3 Water pollution

- 1 Decrease of water and wars because of it
- 2 Rationalization of consuming of water
- 3 Nile water pollution.
- 4 Citizenship and protecting of water from pollution

LESSON 4

- According to your previous study, you know that water is necessary for the survival of all living organisms. Water is so important in agriculture, industry and personal uses.

What you should know

You studied before that water,

Molecule is composed of the combination of one oxygen atom with two hydrogen atoms to form two single covalent bonds, the angle between them is 104.5° Fig (1)

Due to large electronegativity of oxygen compared with hydrogen, a weak electrostatic attraction is originated between water molecules which is called hydrogen bond. Fig (2)

Although these hydrogen bonds are weaker than the covalent bonds in the same molecules, they are considered to be the most important factors which are responsible for abnormality of water properties.

Properties of water

Water is a unique substance due to its existence in three states at the ordinary temperature fig. (3) and it has many physical and chemical properties like

Classroom performance

Participate with your co-operative group under the supervision of your teacher to do the following activity



Water molecule

Figure 1



Bonds between atoms and molecules in water

Figure 2



Three states of H₂O

Figure 3



Identifying water as a polar solvent

Identifying water as a polar solvent

Three beakers Table sugar Table salt
Food oil Stirring spoon

Steps:

- 1 Fill the beakers with water.
- 2 Put in the first beaker a spoon of table sugar, a spoon of table salt in the second beaker and a drop in the third beaker (fig. 4)
- 3 Stir the contents of the three beakers

Observations:

- What are substances which dissolved in water?
- What are the tastes the first solution and the second solution?

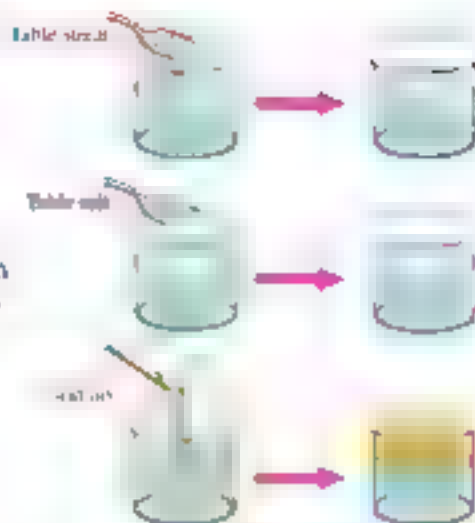


Figure 4

Conclusion:

- 1 Some substances dissolve in water while others don't dissolve in it.
- 2 Water is a good polar solvent for most ionic compounds (as table salt) and for some covalent compounds (as sugar) which form hydrogen bonds with water.

High boiling and melting points

It was supposed that the boiling point of water is less than 100°C and the freezing point is less than zero Celsius. But the pure water at the normal atmospheric pressure boils at 100°C and freezes at zero Why?

High boiling and freezing points is due to the presence of hydrogen bonds between water molecules.

Water Molecules and Hydrogen Bonds

The density of water when it is in a solid state is lower than its density when it is in a liquid state because when the temperature decreases less than 4°C the water molecules are connected by hydrogen bonds forming large sized hexagonal crystals with many spaces between them (Fig. 9). So ice floats on the surface of water in the frozen zones which make marine organisms be still alive.



Hexagonal ice
Figure 9

Self Inquiry

Did you ask yourself about the reason of explosion of closed bottles which completely filled with water in the freezers?



Figure 10

Enrichment information (2)

Density of salt water is higher than the density of fresh water so swimming in the sea is easier than swimming in the poles.

Search for and investigate why the Dead Sea in Palestine was called by that name- write a report and keep it in the portfolio.

Life application Dissolving the ice of the freezer quickly.

Turn off fridge, put a hot water container in the freezer and close the fridge (you can use the hair dryer to direct a hot air current to ice and it melts quickly).

Experiment 7: Neutralization of water

Participate with your classmate to do the following activity which explains the neutralization of water



Discovering the neutralization of water

Substances and tools

- Basin containing pure water
- Two litmus papers (red - blue)



Figure 7

Step 1:

What is the effect of putting both of litmus papers in pure water (fig. 7)

From the previous we conclude that

The pure water has a neutral effect on both of litmus papers (red and blue)

Experiment 8: Electrolysis of water



Investigating the process of electrolysis of water

Substances and tools

- | | |
|-------------------------------|--------------------|
| • A round piece of 1-cm plate | • Two pencils |
| • Sodium carbonate spoon | • Water |
| • Empty plastic bottle | • Two copper wires |
| • Battery 4.5 V. | • Wax gun |
| • Two test tubes | |

Step 1:

- 1 Cut the top of the plastic bottle and fix it to its middle with water and dissolve sodium carbonate in it
- 2 Make a hole in the foam as in fig. (8).

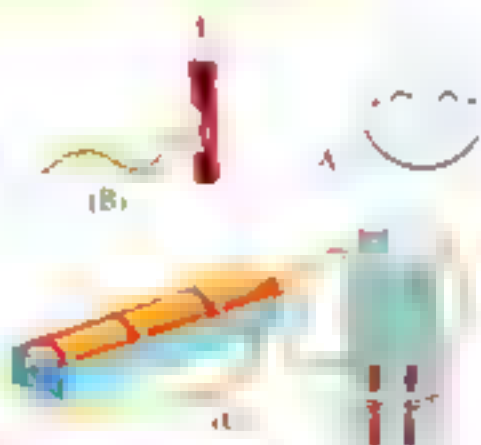


Figure 8

LESSON 4

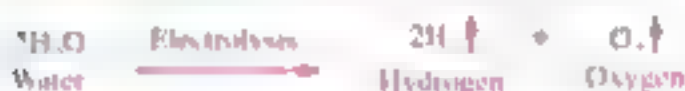
- Remove carefully the wooden part of the two pencils until graphite appears, cut the copper wire around them as in fig. (8 B) & cover the bare part by wax/gum.
- Form the apparatus as in fig. (8 C) and close the circuit for 10 minutes.

Observations

- What is the ratio between two volumes of evolved gases over the negative pole (Cathode) and the positive pole (Anode)?
- What is the effect of approaching a glowing splint to the gas formed at
 (i) Cathode
 (ii) Anode

Conclusions

Acidified water decomposes by electricity into two elements hydrogen and oxygen and the volume of hydrogen is twice the volume of oxygen.



Hydrogen evolves above the cathode while oxygen evolves above the anode. Hoffman's voltmeter is used in electrolysis of water fig. (9).

Exercise (1)

On the electrolysis of a certain volume of acidified water by dilute sulphuric acid the volume of evolved oxygen gas was 2 cm³. What is the volume of hydrogen gas evolved?

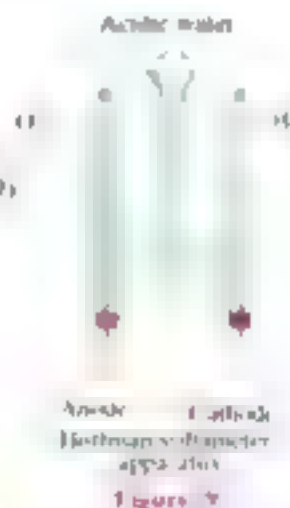


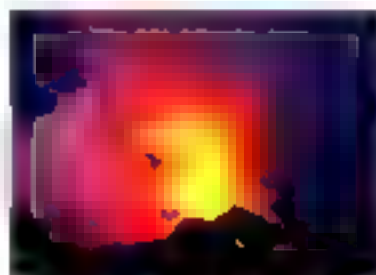
Figure 9

Water pollution and their sources

Environmental pollutants are divided generally into two kinds.

Natural pollutants Their sources are natural phenomena like occurrence of volcanoes fig. (10), lightning accompanied by thunderstorms and death of living organisms.

Artificial pollutants Their sources are the different human activities.



Natural activities

Figure (10)

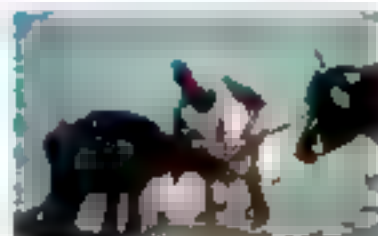
Exercise (2)

Mention many examples for water pollutants whose sources are human activities.

Water pollution due to human activities

Biological pollution

It is originated from mixing of human and animal wastes with water fig (11) and that causes many diseases such as B. tharria, typhoid and cholera hepatitis.



Polluted Nile is due to animal waste.

Figure (11)

Chemical pollution

It is originated from discharging of factories wastes fig (12) and sewage canals, rivers and seas fig (3). The increase of some elements concentration causes great harms. Eating fish which contains high ratios of lead causes the death of brain cells. Drinking water which contains high ratio of mercury leads to brain loss. Arsenic increases the rate of infection by liver cancer.



Discharging of industrial wastes in the canals.

Figure (12)

Thermal pollution

It is originated from the rise of temperature of some marine zones which use water for cooling the nuclear reactors which destroy the marine organisms found in them due to separation of dissolved oxygen in water fig (14).



Discharging of cooling water in the sea.

Figure (13)

Nuclear pollution

It is originated from leakage of radioactive substances from the nuclear reactors or dumping of the atomic wastes in seas and oceans.

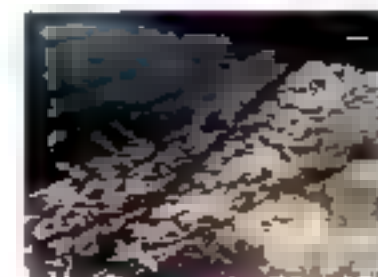


Figure (14)

At the end of the lesson, you should be able to:

- 1 Getting rid of the phenomenon of discharging of sewage, factories wastes and dead animals in rivers or canals
- 2 Development of water purification stations (fig. 15) and making periodic analysis to determine the rate of its validity for drinking
- 3 Spreading environmental awareness among people about protection of water from pollution
- 4 Disinfecting drinking water tanks above buildings periodically (fig. 16)
- 5 Don't store the tap water in empty plastic bottles of mineral water because they react with chlorine gas which is used in disinfecting of water, so the rate of cancer infection increases



Water purification station

Figure 15



Water tank

Figure 16

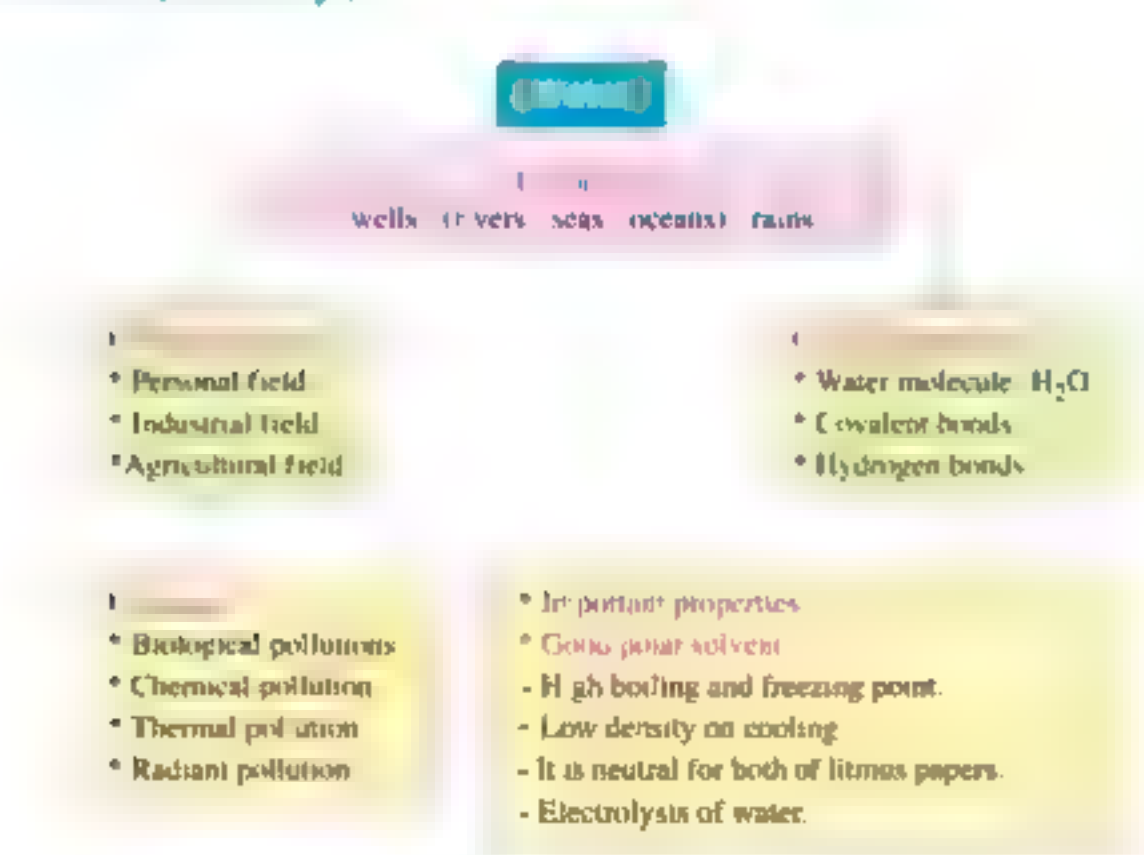


A case for discussion: Water = Life

Wars may break out due to fresh water, at the same time some people don't keep water resources well. Discuss with your classmates under the supervision of your teacher this case. Use these questions in the discussion.

- 1 Did you try the feeling of being thirsty?
- 2 What is your role and responsibility for the unfixed water tap at school or at home?
- 3 What do you feel about when you see victims of drought in Africa in the broadcast?
- 4 What should you do when you find a person throwing wastewater in the Nile?
- 5 What are your suggestions for keeping water of the Nile?

Lesson summary :



Hydrogen bond is considered one of the most important factors that are responsible for the abnormality of water.

Hoffman's voltameter apparatus is used in the electrolysis of water.



1. Choose the correct answer (A, B, C or D):

All of the following are from the properties of water except (neutral on both litmus paper, analysis by heat, increase in volume on heating, polar compound)

(2) There are bonds between water molecules
(hydrogen / covalent / ionic / metallic)

A liquid boils at 100 °C, what is the other property which affirm it is a pure water ?
(Sugar dissolves in it, when it freezes, density decreases, neutral on both litmus paper, it evaporates on heating)

2. Give reasons for

Presence of hydrogen bond between water molecules

(2) Pure water doesn't affect litmus paper dye

Although sugar is a covalent compound, it dissolves in water

3. What are the results of ?

Water is polluted by the wastes of Man and animal

(2) Storing water in plastic bottles of mineral water

4. Choose from (B) what suits (A) column

(A)	(B)
(1) Death of brain cells	(4) Lead
(2) Cancer of Liver	(3) Sodium
(3) Blindness	(1) Mercury
	(4) Arsenic

5. Hydrogen gas is collected by downward displacement of water.

Write the chemical equation which illustrates the chemical reaction.

What is the volume of gas which burns with a pop sound when you approach a glowing spirit to it if the volume of the other gas is 6 cm³?

- (7) What is The name of The Collected gas at

Cathode

Anode

6. Name the gas which is evolved at the cathode.

Explain this phrase

7. Electrolysis of acidified water.

8. Write the chemical equation for the electrolysis of acidified water.

Unit Revision

1 Choose

Scientist _____ discovered the main energy levels in the atom.

Bohr / Mendeleev / Moseley / Rutherford

Sodium oxide from _____ oxides (amphoteric / acidic / nonmetallic / basic)

All the following elements are semimetals except for _____

(tellurium / silicon / boron / bromine)

The strongest metal lies in the _____ group (2A / 1A / 1B / 3A)

2 What is meant by '_____'

1 Chemical activity series?

Water pollution? _____

Semimetals _____

3 i _____

4 What is the importance of _____

1 Liquefied nitrogen _____

2 Sodium _____

3 Water _____

5 Give reasons for _____

1 The use of radioactive Co 60 in food preservation _____

Elements of the same group have similar properties _____

The boiling point of water is high _____

4 Alkali metals are kept under kerosene in the lab _____

6 Give reasons for _____

1 Drainage of factories wastes in rivers and seas _____

Using of rivers and seas water as a renewable source _____ or cooling the nuclear reactor _____

3 Mixing of animal and Man wastes with water _____

Unit 2

The Atmosphere and protecting Planet Earth

Unit lessons

- 1 The Atmospheric Layers
- 2 Erosion of Ozone Layer and Global warming

Learning Resources

- 1 The air - sty barkar - Dar El Farouk
- 2 The air - Dr. Abd El Baset El gamal - Suter
- 3 Weather disasters - E. Dia El Hadeva for publishing and distribution
- 4 Climate Crisis - Nigel Hocky - Acquaemina

Unit objectives

- 1 Know the concept of atmospheric pressure and layers of atmospheric envelope
- 2 Interpret the change of atmospheric pressure with changing height above sea level
- 3 Appreciate the importance of instruments that measure atmospheric pressure
- 4 Describe the characteristics of atmospheric layers
- 5 Compare among the characteristics of atmospheric layers
- 6 Conclude the importance of each layer of atmosphere
- 7 Recognize the importance of studying each layer of the atmosphere
- 8 Appreciate the role of scientist in such devices measuring atmospheric pressure
- 9 Know the composition of Ozone gas
- 10 Conclude the steps of Ozone formation.
- 11 Aware of the importance of the Ozone layer of the human and living organisms
- 12 Describe harmful effects of pollutants on Ozone layer
- 13 Determine ways to protect Ozone layer
- 14 Follow up the procedures and solutions to the problems of ozone depletion
- 15 Describe the global warming phenomenon and greenhouse effect
- 16 Identify greenhouse gases
- 17 Explain increase the temperature of atmospheric envelope of earth
- 18 Determine the negative effects resulted from the rising temperature of the earth's atmosphere
- 19 Follow up the procedures and solution to problems of global warming phenomenon
- 20 Appreciate greatness of God in providing the atmosphere and air for living organisms

Lesson 1

The Atmospheric Layers

Lesson objectives :

- 1 Know the concept of atmospheric pressure
- 2 Interpret the change of atmospheric pressure with changing height above sea level
- 3 Understand the change of atmospheric pressure with changing height above sea level
- 4 Appreciate the importance of instruments that measure atmospheric pressure
- 5 Mention the importance of altitude
- 6 Know atmospheric layers
- 7 Mention the characteristics of atmospheric layers
- 8 Compare among the characteristics of atmospheric layers
- 9 Determine the importance of each layer of the atmosphere

- 1 Atmospheric pressure
- 2 Change of atmospheric pressure with height above sea level
- 3 Atmospheric layers

- 1 Instability of weather
- 2 Laws and rules of the internet communication

Atmospheric pressure

The Earth is surrounded by a gas envelope that clings with it about 100 km and extends 1000 km above sea level. It is known as **atmosphere**.

The weight of air column of an atmospheric height in a unit area is called an **atmospheric pressure**. It is measured in a unit called a bar. **1 bar** equals 1000 m.dbar (mbar).

Normal atmospheric pressure at sea level equals 1013.25 mbar.

The internal pressure of human body equals the atmospheric pressure. How does climbing heights or diving deep in ocean affect eardrum?

Change of atmospheric pressure with change in height above sea level

Share your cooperative group in performing the following activity.



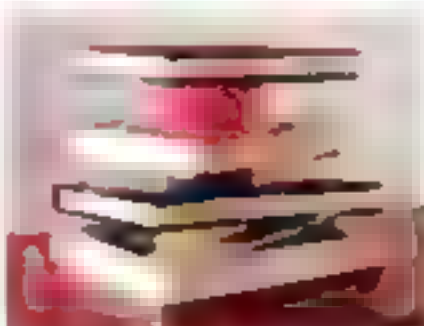
Proving how atmospheric pressure changes with changing height above sea level.

Materials and tools

- 4 big books
- 3 pieces of modelling clay with different colors
- 6 plastic sheets

Procedure

- 1 Form the modelling clay into 3 identical balls.
- 2 Put clay balls between the plastic sheets and the books.



Observations

- 1 Do the balls' shape change? Why?
- 2 Which ball did change more? Why?
- 3 Which ball did change less? Why?

As the weight (pressure) of books increases due to the number (height) the change in balls' shape increases.

Likewise, atmospheric pressure increases as the height of air column increases.

It was found that

50% of atmosphere mass occurs in the area between sea level and 3 km high. Meanwhile 90% of its mass is concentrated in the first 16 km above sea level.

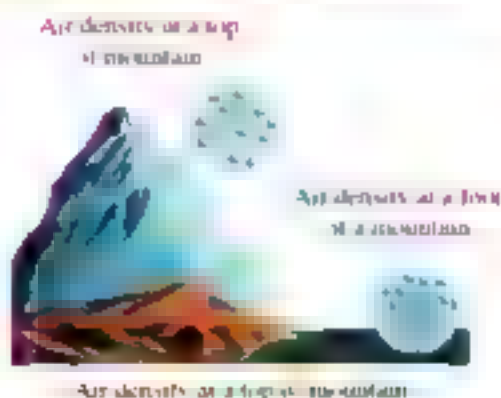
Atmospheric pressure decreases with the increase in altitude.

Atmospheric pressure decreases with the increase in altitude.

Exercise (1)

In airplanes, an altimeter is used to determine the elevation of the navigation based on the atmospheric pressure at this level.

Choose the values of atmospheric pressure that suit the elevation above sea level (Table 1).



Altimeter in airplanes

Altitude (km)	Atmospheric pressure (millibar)
3 km	203 m bar
6 km	731 m bar
9 km	323 m bar
12 km	503 m bar

The greatest atmospheric pressure that ever recorded so far on the earth's surface was in January 1968 in Siberia when it reached 1080 millibar. On the other hand, the lowest pressure was 870 millibar where it is recorded in the eye of the tropical hurricane "Typhoon" in 1979.

Exercise (2)

Use a curved line to connect the points indicating equal pressure (isobars in fig. 4) to make a surface pressure map. Then mark the center of low pressure with letter L and the center of high pressure with letter H.



Atmospheric pressure (mbars)	Symbol	Atmospheric pressure (mbars)	Symbol
1011	☐	998	▲
1017	□	995	■
1014	□	1000	●
1020	□	1005	▲

Atmospheric pressure map

Real life application Barometer to determine today's weather

The possible day's weather can be estimated directly with an instrument known as Aneroid (fig. 4). It's a type of barometer, which is used to measure atmospheric pressure.



Layers of atmospheric envelope

Atmospheric envelope is divided into several layers according to the changes in the atmospheric pressure and temperature. They are illustrated by the following activity.



Recognizing atmospheric layers

Study and investigate figure (5) and write down your observations after answering the following questions.

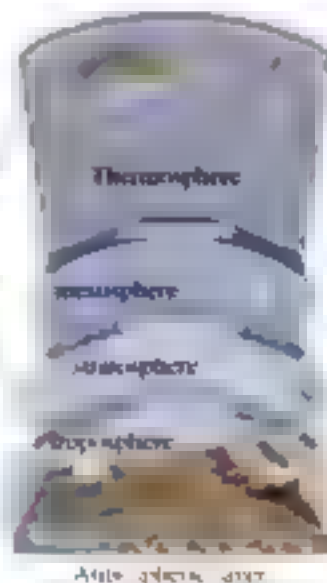
- (1) How many layers are in the atmosphere?
- (2) Name these layers, starting from sea level.

Write your answers in the following table.

First and second layers:

(a) Second and third layers:

(c) Third and fourth layers? :



Atmospheric layers

First Layer – Troposphere

Troposphere is the first layer of the atmosphere. It means the disturbed layer where most of the weather changes occur in this layer.

To know the characteristics of the troposphere, share your working group in performing the following activity.

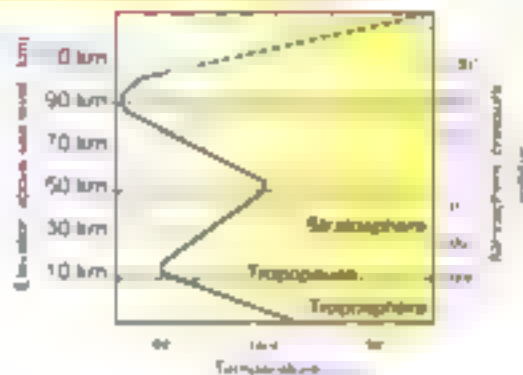


Concluding the characteristics of the troposphere

Investigate figure (7) carefully with the help of your group and conclude the characteristics of the troposphere by answering the following questions:

- 1) What is the approximate thickness of the "sphere layer"?

Write your answer in the space provided.



- 2) What is the value of the atmospheric pressure at the end of the layer?

- 3) What is the value of the temperature at the end of the layer?

Characteristics and importance of the troposphere

- 1 It extends 11 km above sea level – the tropopause.
- 2 As we go up, the temperature decreases by a rate of 6.5°C per 1 km until it reaches the lowest value of about (-60°C) at tropopause.
- 3 Atmospheric pressure decreases as we go higher where it reaches about 0.1 of the normal pressure at sea level.
- 4 It contains about 75% of the atmospheric mass. This explains why all atmospheric phenomena like rain, wind, clouds, etc. (fig 8) that forms the weather conditions and consequently up the climate occurs in this layer and affects the activities of living organisms.

Troposphere thickness is 11 km. It is an average thickness as it is about 8 km above poles and 18 km at the equator.



Clouds and winds

LESSON 1

- 5 It contains about 99% of the atmospheric water vapour which organizes the earth's temperature
- 6 The air movement in this layer is vertical (fig. 9) as the warm air currents go up and the cold currents go down

Self-Inquiry

Have you ever asked about the characteristics – the heights and low areas relative to sea level in Egypt? Where they are?



Communication

By the guide of your teacher discuss with your classmates the advantages and disadvantages of living in these areas?

Exercise (3)

If the temperature at the base of mount Everest is 20.6°C how much is the temperature at its top if the mountain height is 8842 m?

Solution:

Height (km) =

The decrease in temperature = height (km) $\times 6.5 =$

Temperature at the top = temperature at the base – decrease in temperature

Second layer – Stratosphere

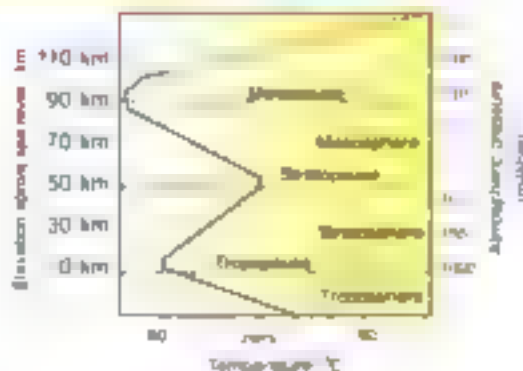
Stratosphere is the second atmospheric layer which is also called ozone atmosphere. Why?



Concluding the characteristics of the Stratosphere

Investigate figure (10) carefully with the help of your group and conclude the characteristics of the stratosphere by answering the following questions

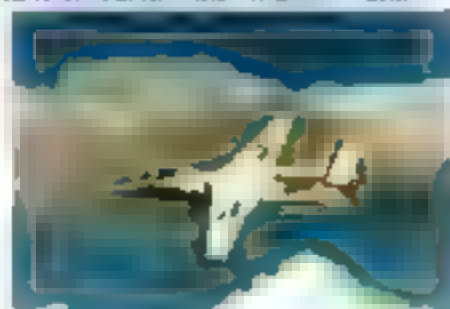
- 1 What is the name of the two areas where between them stratosphere is located?



2. Why is the thickness of the troposphere?
3. Why is the temperature in the troposphere going to drop?
4. Why is the troposphere called the weather zone?

Characteristics and importance of the stratosphere:

1. It extends from tropopause (13 km above sea level) to the stratopause (50 km) with thickness of 37 km.
2. At the lower part, the temperature is constant and measure (+ 60° C) then increases gradually until it reaches 0° C at the end of the layer. This is due to the absorption of ultraviolet radiation (emitted from the Sun) by the ozone layer that is present in the upper part of the layer.
3. The atmospheric pressure decreases on going higher where it reaches the smallest value (0.001 of the normal pressure at sea level) at the end of the layer.
4. It contains most of the atmospheric ozone which is concentrated between 30 - 40 km above sea level.
5. The lower part does not contain clouds or suffer from any weather disturbances. The air moves in this part horizontally, making it suitable for flying planes (fig. 10).



Flying in the stratosphere

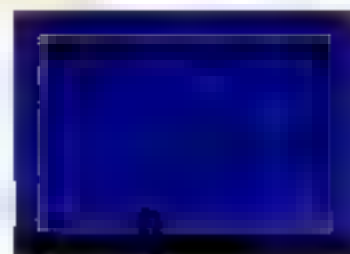
Third layer: Mesosphere

Mesosphere is the third atmospheric layer.
It means the middle layer. It is the coldest layer.

Characteristics and importance of the mesosphere:

1. It is extended from the stratopause (50 km above sea level) to the mesopause (85 km) with thickness of about 35 km.
2. Temperature decreases with height rate until it reaches (- 90° C) at its end.
3. This layer is much vacuum as it contains only a limited amount of helium and hydrogen gases.
4. Meteors are formed in this layer and burnt due to friction with air molecules (fig. 12).

Although meteors burn in the mesosphere, spacecrafts don't burn during passing through it as they have a critical front that disperses heat and tails made of an insulated material.



Simulation of meteors in the mesosphere

Fourth layer: Thermosphere

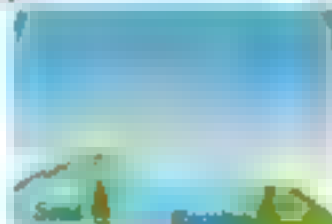
Thermosphere is the fourth atmospheric layer. It means the heated layer as it is the hottest layer of the atmosphere.

Characteristics and importance of the thermosphere

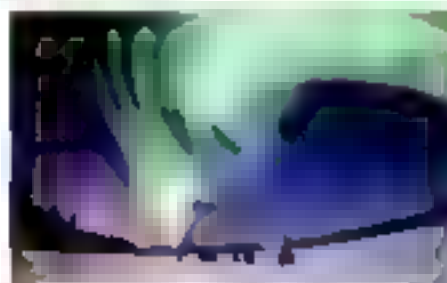
- 1 It extends from the mesopause to 675 km above sea level with a thickness of about 590 km.
- 2 Temperatures increase rapidly with going higher until it reaches about 1000°C.
- 3 Its upper part contains charged ions. The distribution of the charged ions extends out 1700 km above sea level, in a part known as ionosphere.

☑ Ionsphere plays an important role in wireless communication and broadcasting as it reflects radio waves that are transmitted by communication centers and radio stations (fig. 13).

☑ Ionsphere is surrounded by two magnetic belts known as Van Allen belts (fig. 14). These two belts play an important role in dispersing the harmful charged cosmic radiation away from the Earth. In the same time, they cause the Aurora Borealis which appears as brightly colored light curtains at both the North and South poles of the Earth (fig. 15).



Reflection of radio waves by the ionosphere.



Aurora phenomenon.

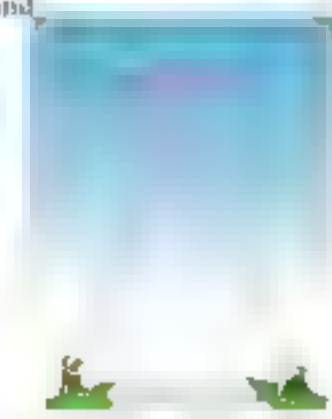


Van Allen Belts

The atmosphere is inserted into the outer space via an area known as the **thermosphere**. This is the area where satellites float around the Earth (fig. 16) and transmit weather condition information and TV programs.

The Egyptian Satellite (Nile sat) transmits a number of different educational channels that you can watch on digital space channels.

Record the dates of broadcasting of the educational material you study on the educational channels during a week and distribute them among your classmates to benefit from them.



Role of satellites in wireless communication.



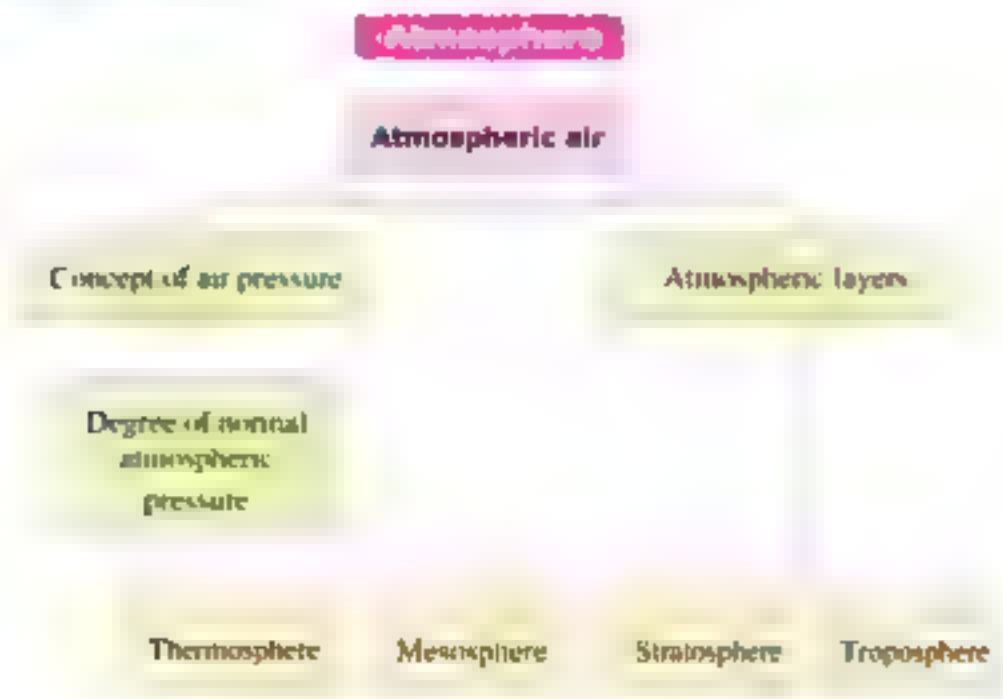
A case for Discussion Space channels

Space channels use satellite to transmit media and commercial materials. Some of them is useful and acceptable. Others contradict morals and religion principles.

Guided by your teacher, discuss this issue with your classmates. Use the following questions as part of a discussion subject.

- Q1 What are the channels that you watch? Why?
- Q2 What are the interesting programs that you watch in these channels?
- Q3 Does one of your friends watch channels that transmit obscene material?
- Q4 How do you deal with such channels in a civilized manner?

Lesson summary



- Q1 Atmospheric pressure is the weight of air column on unit area.
- Q2 Normal atmospheric pressure at sea level equals 0.325 millibar .
- Q3 Temperature in troposphere decreases on getting higher, the rate of decrease is $6.5^\circ \text{C}/1\text{km}$.
- Q4 The ionosphere is surrounded by Van Allen Belts which are responsible for dissipating harmful cosmic rays away from the Earth.



Atmosphere and Space

1. Fill in the blanks with suitable words.
 - (a) Normal atmospheric pressure equals _____ mm-hgbar
(1013.25 / 76 / 1.013 / 760)
 - (b) _____ is located between stratosphere and mesosphere
(Tropopause / Stratopause / Mesopause / Thermopause)
 - (c) Meteors burn in _____.
(mesosphere / ionosphere / exosphere / stratosphere)

2. Give reasons for
 - (a) The lower part of the stratosphere is suitable for flying airplanes.
 - (b) Ionosphere is important for radio signals.

3. Mention the importance of each of the following.

- (a) Van Allen's Belts
- (b) Altimeter
- (c) Satellites

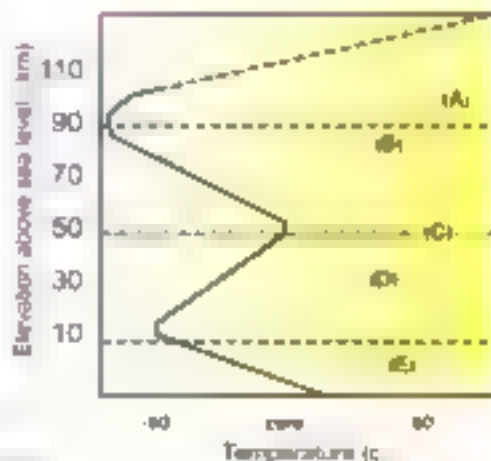
4. Answer the following questions in brief.

5. What is meant by each of the following?

- (a) Atmospheric pressure
- (b) The aurora phenomenon.

6. The opposite figure exhibits the temperature changes in the atmospheric layers.

- (1) Replace the letters on the drawing with suitable labels.
- (2) Which layer is
 - The highest in temperature
 - The least in temperature





Activity



In less than 10 lines, write an editorial about the effect of getting higher above sea level on the life of Man, using magazines, periodicals, encyclopedias, and school library or internet sites.

Lesson 2

Erosion of Ozone Layer and Global Warming

Lesson objectives :

By the end of this lesson, you should be able to:

- 1 Know the composition of Ozone gas.
- 2 Conclude the steps of ozone formation.
- 3 Appreciate the importance of Ozone Layer.
- 4 Describe the harmful effects of short and medium wave length ultraviolet radiation on the Ozone Layer.
- 5 Mention the pollutants of Ozone Layer.
- 6 Determine ways to protect Ozone Layer.
- 7 Describe the global warming phenomenon and the greenhouse effect.
- 8 Identify greenhouse gases.
- 9 Interpret the rising temperature of the earth's atmosphere.
- 10 Determine the negative effects resulted from the rising temperature of the earth's atmosphere.
- 11 Follow up the procedures and solutions to the problems of erosion of the ozone layer and global warming.

- 1 Composition of Ozone gas.
- 2 Importance of Ozone Layer.
- 3 Erosion of the Ozone layer (ozone hole).
- 4 Pollutants of Ozone Layer and their effects.
- 5 Protecting the Ozone Layer.
- 6 Greenhouse effect and global warming phenomena.
- 7 Negative effects due to global warming.

Included cases :

- 1 Erosion of the Ozone Layer (ozone hole).
- 2 Impacts of science and technology on the society.
- 3 Greenhouse effect phenomenon.
- 4 World condition.
- 5 Managing energy consumption.

- Since the mid 20th century erosion of the Ozone Layer depletion and global warming phenomena have been the most serious threats



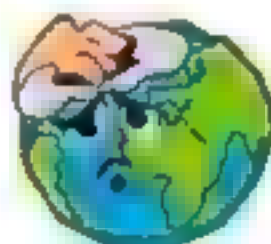
Fig. 4.1 Effect of pollutants on the atmosphere

First Erosion of the Ozone Layer phenomenon

Composition of ozone gas

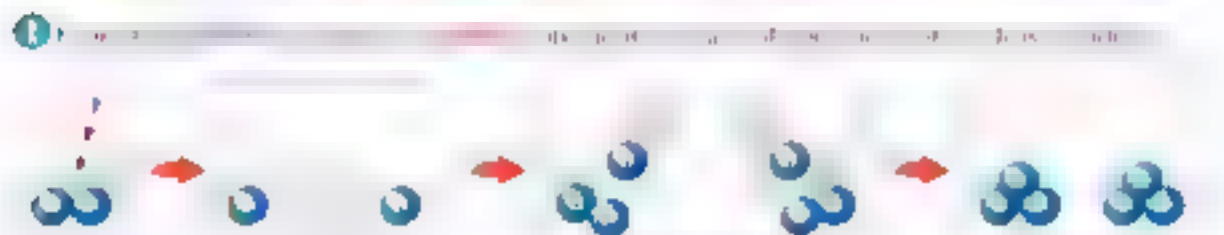
You may ask – why is Ozone layer formed in the stratosphere

What is ozone gas? How is it formed?



Concluding how ozone gas forms

Observe and investigate with your class, notes the following figures, then conclude how ozone gas is formed



- Absorption of ultraviolet radiation by gas molecules
- Combining a free atom with a molecule of the same gas
- Formation of Ozone molecule
- Break down the bond in the gas molecule and formation of two free atoms

2. What is the gas that its molecules absorb the ultraviolet rays

3. What is the resultant formula of the Ozone molecule

Based on the previous, ozone gas is formed in two steps.

- Breaking down the bond of the oxygen molecule O_2 when it absorbs the ultraviolet radiation (UV) producing two free active oxygen atoms $2O$



- Each free oxygen atom combines with an oxygen molecule to produce an ozone molecule (fig. 4)



Fig. 4

Ozone gas has a faint blue color and of distinct smell. This can be observed near instruments that contain electric discharge pipes as in the cases of light photographic machines and TV sets. Mention instruments produce ozone gas when they are set to work.

- Ozone layer is formed in the stratosphere and is located at a height between 20-40 km above sea level. Ozone layer is the first atmospheric layer that meets the ultraviolet radiation coming from the Sun. This layer contains a variable amount of oxygen gas.



Investigate figure (5) and determine the type of ultraviolet radiation that does not penetrate Ozone Layer

- with ratio 100%
- with ratio 95%

Barometer = 1×10^{-4} meter



Ozone layer does not allow penetration of all far and most of medium ultraviolet radiations, which have very harmful effects. That is why Ozone is said to act as a protective shield for living organisms against the harmful chemical effects of the ultraviolet radiation.

Ultraviolet radiations, of wavelength close to the visible light penetrates the atmosphere and reaches the earth's surface, where it helps in producing Vitamin D in the bodies of the newly born babies.

Thickness of the Ozone Layer

Temperature and atmospheric pressure at Ozone layer differ from those at earth's surface. The English Scientist Dobson postulated that the thickness of the Ozone Layer is 3 mm only if it were under the normal pressure and 0°C temperature—a condition known as S.T.P. (Standard Temperature and Pressure) (Fig. 6). Accordingly, he assumed that the natural amount of ozone equals 300 Dobson units.



The thickness of ozone layer under S.T.P.

Exercise (1)

What is the ratio of erosion of the Ozone layer in an area if you know that the degree of its Ozone is 150 Dobson?

Since 1978, scientists have noticed that there was erosion of the Ozone layer above the South Pole phenomenon known as *ozone hole*. It increases in September each year. Why? Its rate changes from year to year (Fig. 7).

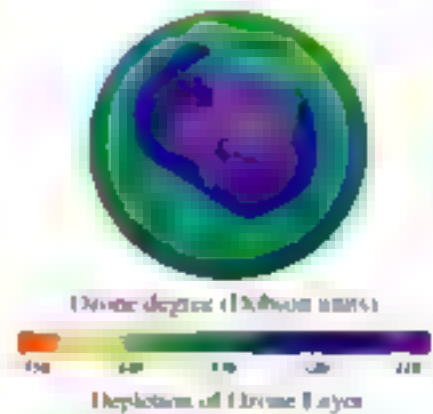
In fall, 2001 erosion of the Ozone layer reached $20 \times 10^6 \text{ km}^2$ which equals twenty times the area of Egypt. In autumn, 2008 it reached $27 \times 10^6 \text{ km}^2$ an area is larger than North America.

Exercise (2)

Use Dobson units at the base of figure (7) which represents the Ozone condition in full, 2008, to show what each of the following indicates.

Green color _____

Violet color _____



Pollutants of Ozone Layer

The most dangerous pollutants are:

1. **Chlorofluorocarbons (CFCs)**
They are commercially known as Freon, which is used as a cooling material in air conditioning sets, as propellant in aerosols or as a foaming material in making foam backing or as a solvent for cleaning electric circuit cards (Fig 8).
2. **Methyl bromide** that is used as an insecticide to preserve stored agricultural crops.
3. **Halons** that are used in fire extinguishers.
4. **Nitrogen oxides** that result from the burning fuel of ultrasound airplanes (Concord).



Activity

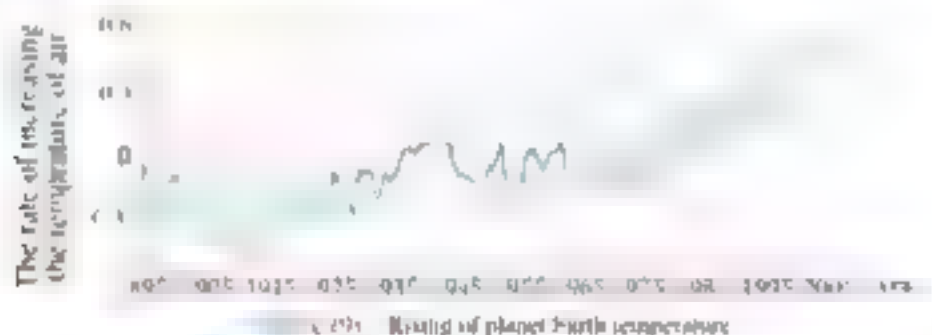
Use The internet or any available Source To search about the Egyptian role in the international environmental affairs and the efforts of Dr Mostafa Kamal Tolba in this field.

Remember

- Use of chlorofluorocarbon compounds must be reduced and find safer alternatives
- Stop producing the ultrasound concert pianos as their exhausts affect the Ozone

Second Global Warming

- 13 Researches of the IPCC (The Intergovernmental Panel on Climate Change) that follow UN showed that there is an increase in the average temperature at the Earth's near surface air, a phenomenon known as Global warming which is caused by the greenhouse effect. What can you conclude from the figure below?



Greenhouse effect

Share your group in performing the following activity to know the greenhouse effect phenomenon



Greenhouse effect

Materials

- 2 empty soda bottles
- 2 thermometers
- Sodium bicarbonate powder
- Vinegar
- Water



LESSON 2

Procedure:

- 1 Pour some water in the first bottle and a same amount of vinegar in the second.
- 2 Insert a thermometer in each bottle.
- 3 Put some sodium bicarbonate powder in one bottle and close it immediately to keep CO_2 gas trapped.
- 4 Put both bottles in a sunny place fig. (10).

Observation:

Which bottle shows bigger increase in temperature after 10 min.

Conclusion:

Increase of the concentration of CO_2 gas contributed to higher temperature.

- The same is happening as the temperature of planet Earth has been increasing since 1985 due to the greenhouse gases in the atmosphere. These gases are produced by fossil fuel burning fig. (11), cutting trees and forest fire.



Products of burning fossil fuel

The most important greenhouse gases

- Carbon dioxide gas CO_2
- Chlorofluorocarbons (CFC's) compounds
- Methane gas CH_4
- Nitrous oxide N_2O
- Water vapour H_2O

Greenhouse gases are considered a blessing which can be changed into a catastrophe without these gases the temperature would have decreased to -18°C . The increase of its concentration in the atmosphere will lead to environmental disasters.

Interpretation of the greenhouse phenomenon:

When the concentration of greenhouse gases increases in the atmosphere, it plays the role of glass in the greenhouse (Fig. 12) as it permits the visible light and short-waved radiation from the Sun to pass and be absorbed by Earth and its components which reemit the radiation back in the form of infrared radiation. Infrared radiation cannot penetrate the atmosphere as it has a long wave length. So it is kept trapped in the atmosphere causing the rise of planet Earth temperature, a phenomenon known as **greenhouse effect**.



Greenhouse



Greenhouse phenomenon

The negative effects of Global Warming Phenomenon

One of the most dangerous effects is related to the phenomenon of raising the temperature of the Earth planet.

Melting of the ice and snow of both South and North Poles

Melting of polar ice would increase sea level, rivers and oceans, which represents a threat of the disappearance of the coastal areas and that would lead to the extinction of some polar animals like the polar bear (Fig. 15) and seals (Fig. 16).



Melting of snow masses

Figure (14)



Polar bear

Figure (15)



Seals

Severe climatic changes

Among these features is the repeated occurrence of tropical hurricanes (Fig. 17), such as hurricane Katrina in 2005, destroying floods (Fig. 18), drought waves (Fig. 19) and forest fires.



Tropical hurricane



Flood



Drought wave



Activity

Use The internet or any available Source To search about saving the used energy at homes. then discuss it with your teacher

Lesson summary

The Ozone in the Atmosphere

Stratosphere

Troposphere

Ozone Layer

Global Warming

Composition Its importance Its pollutants Its protection

Greenhouse Effect

Negative effects

- Ozone molecule (O_3) is formed by combining one free oxygen atom with one oxygen molecule
- Ultraviolet radiation: low and medium types have harmful effects on the life of living organisms.
- Chlorofluorocarbon compounds are the most dangerous Ozone Layer pollutants
- Increasing CO_2 concentration in the atmosphere produces the global warming phenomenon



1. Write short note about the following:-

- A molecule is formed from combining an atom of an element to a molecule of the same element.
- Continuous increase in the average temperature of the air near the surface of the Earth.

2. Write short note about the following:-

- Ozone Layer is measured by a unit called
- All are greenhouse gases except

3. Write short note about the following:-

- Formation of Ozone Layer in the stratosphere.
- Stop Producing Concorde airplanes.

4. Write short note about the negative role of

LESSON 2

- 6 Calculate the height of a mountain if the temperature at its foot is 31°C and at its top is -6°C .

Unit 3

Fossils and Protecting Species from Extinction

Lessons of the unit

Lesson 1 Fossils

Lesson 2 Extinction

Sources of knowledge and learning

• Scientific books and encyclopedias

1 The Rocks – Natar

Family library

2 Disasters – Nedham

Our 11 Farouk

3 Guinness Q & A – The world of animals

Family library

4 Forests

Lebanon library publishers

Unit objectives

- 1 Recognize the concept of fossil
- 2 Give different examples of fossils
- 3 Infer the types of fossils
- 4 Explain the ways of fossils formation
- 5 Design a cast of a candle
- 6 Design models of cast and mold
- 7 Compare between types of fossils
- 8 Mention the importance of studying fossils
- 9 Calculate the age range of some fossils
- 10 Appreciate the importance of the discovery of fossils in the service of man environment and society
- 11 Establish a vision to take responsibility and take personal decisions to protect fossils
- 12 Collect data and information and express his opinion in the protection of fossils and their scientific and social importance
- 13 Use research skills and inquiry in the study of fossils
- 14 Define the concept of extinction
- 15 Use fossils to indicate extinction of some types of organisms
- 16 Conclude the factors that cause extinction of some types of living organisms
- 17 Give examples of extinct and re-emerged species
- 18 Understand the effects of extinction on ecological equilibrium
- 19 Suggest new solutions to protect living organisms from extinction
- 20 Deal gently with the organisms and in a civilized manner with the environment
- 21 Act consciously with the environment and appreciate the importance of normal life
- 22 Appreciate the role of scientists in protecting living organisms from extinction
- 23 Use life skills in the study of extinction and protection of living organisms from extinction
- 24 Write a scientific report on the causes of extinction of some organisms
- 25 Continue and express their views and discuss with his colleagues and the teacher about ways to protect living organisms from extinction
- 26 Appreciate the greatness of God in the creation of living organisms

Lesson 1

Fossils

Lesson objectives:

By the end of the lesson, students should be able to:

- 1 Define the concept of fossils.
- 2 Give different examples of fossils.
- 3 Show the types of fossils.
- 4 Determine the ways of fossils formation.
- 5 Design a cast of a candle.
- 6 Design models of cast and mold.
- 7 Compare between mold and trace.
- 8 Give examples of complete body fossils.
- 9 Conclude the concept of petrification and petrified fossils.
- 10 Explain how the petrified woods are formed.
- 11 Mention the importance of studying fossils.
- 12 Calculate the age range of some fossils.
- 13 Appreciate the importance of the discovery of fossils.
- 14 Take personal decisions to protect fossils.

Points of the lesson

- 1 Concept of fossil
- 2 Types of fossils and their formation
- 3 Importance of fossils

The scientific, technological, and social importance of fossils

LESSON 1

Fossils – an exciting world – a story told by rocks – tells us about the deep past million years ago even before the creation of man on Earth.

Fossil concepts



Determining the concept of fossil

Organize a trip with your classmates to visit the Geological Museum at the River Nile bank in Zahrat El Maady and observe the fossils present in it.

Observation

What is the name you expect to reflect the residues or traces that indicate?

The activities of the living organisms during its life.

Remnants of a living organism.



Remnants of various tubulars

Figure 1.1



Dinosaur foot print

Figure 1.2



Remnants of dinosaur skull

Figure 1.3



Remnants of tracks teeth

Figure 1.4

Conclusion

Traces and remnants of the old living organisms that are preserved in sedimentary rocks are known as fossils.

Types of fossils and ways of formation

Fossils differ according to the ways of formation.

First type: Fossil of a complete body

Complete body fossil was formed when the organism died and was buried fast in a medium that preserved it from decomposition as in the case of snow or amber. It keeps the whole shape and all the details of the body.

In Latin, the word fossil means something buried in Earth. The science that studies fossils is paleontology.

Examples of a complete body fossil

1 Mammoth fossil

A snow avalanche occurred in Siberia 25000 years ago. It caused the death of mammoth animals, which were also buried immediately in the snow. When the first mammoth fossil was discovered in the last century, it was complete as the whole shape and all hair, flesh and food in its bowels are all still completely preserved.



Mammoth is a type of extinct elephants.

2 Amber fossil

During some old geologic periods, there were common pine trees. These trees secreted resinous matter. This matter covered insects. After the resinous matter had been solidified it was changed into amber and preserved the bodies of these organisms from decaying (Fig. 6).



Insects in amber

Second type of mold

Participate with your group in doing the following activity. Each student makes a different model.



Making model of a mold

Materials and tools

- Plaster of Paris
- Water
- Food oil
- Brush
- Plastic container
- Metal mold
- Rod for stirring

Instructions

- 1 Use the brush to paint the internal surface of the mold with oil.
- 2 Mix plaster of Paris with water and continue stirring to a suitable mixture.
- 3 Pour the mixture in the mold and wait until the plaster of Paris solidifies (Fig. 7).
- 4 Separate the hard mixture from the mold (Fig. 8).



Figure 7

LESSON 1

Observation

What do the details on the internal surface of hard plaster show?



Conclusions

The hardened plaster of Paris forms a solid mold of the metal mold.

Formation of a sand mold

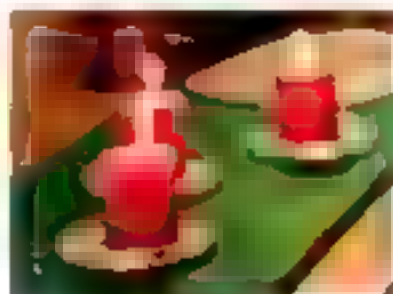
- 1 When a snail or a crab dies, it falls on the sea floor and is buried in sediments.
- 2 The sediments fill up the shell cavities and is solidified as the time passes.
- 3 The shell could decompose completely leaving a rock mold carrying the internal details of the snail (Fig. 9).



A fossilized snail shell.

Real-life application: Candle mold

- 1 Melt paraffin wax or wax remains in a water bath.
- 2 Roll a piece of strong paper into a cylinder. Put it in an empty yoghurt can and then pass a thick thread through the cylinder.
- 3 Pour the melted wax in the cylinder, keeping the thread in the middle all time.
- 4 Remove the paper from around the wax after it solidifies. Put the candle in a suitable glass holder (Fig. 10).



A candle mold.

Third type: Cast



Make a model of a cast

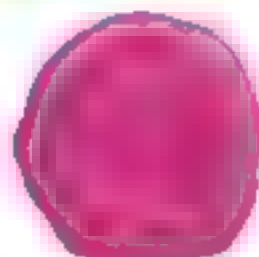
Participate with your group in doing the following activity: each student makes a different model.

Materials and tools

- Coloured clay
- A shell of a clam.

Procedure:

- 1 Press on the clay by your hand to make a plane surface
- 2 Put the shell on the surface of the clay and press it gently
- 3 Remove the shell from the clay



Shell cast
(Figure 11)

Observation:

What do the details in the clay indicate?

Conclusion:

A replica of the original outer shell shape is formed and it is known as cast.

- What a **silhouette** of an organism leaves on sedimentary rocks is called cast (fig 12)?
- What a living organism body leaves during its life is known as trace (fig 13)?



Dinosaur foot print



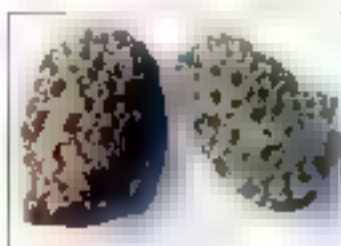
Fish cast

Exercise (1)

Choose the correct term (mold = cast = trace) for each of the following fossils



Fossil of ferns



Fossil of worms tunnels



Fossil of invertebrate

LESSON 1

Fourth type : Petrified fossils

A type of fossils where the minerals can replace the organic matter of organism part by part without changing the shape. for examples



Dinosaur's tooth



Dinosaur's eggs



Petrified wood



Describing petrified wood

Visit with your classmates the petrified wood protectorate in Qattaniya and observe the petrified stems and trunks of trees that are more than 35 million years in age (Fig. 19)

Observation

Are these trees rocks or fossils

Question

- 1 Petrified woods look like rocks but they are fossils because they give us details about once living old plant
- 2 Petrified wood was formed by replacing part by part, of the original wood material by silica, and this is known as **silicification**

An Egyptian dinosaur has been discovered in Bahariya Oasis, 6th October Governorate, and parts of it are being displayed in the Egyptian Geological Museum.

Search for the Egyptian Geological Museum in the internet and write a report about it

Importance of fossils

Fossils are important because they help in

- 1 Age determination of sedimentary rocks
Fossils of the organisms that lived a short period of time in the past and became extinct are known as **index fossils**. They indicate the age of sedimentary rocks because the age of rocks is the same age of fossils existed in them.

2 Figuring out the paleoenvironment

Fossils give an idea about the environment in which they lived during the old geological ages. Therefore, they could also indicate the climate of these ages as shown in the following examples:



Nummulites fossils



Fern fossils



Coral fossils

■ Nummulites fossils

Figure (20)

They are found in the limestone rocks Mokattam's mountain and indicate that there was a sea floor in this area more than 35 million years ago.

■ Fern

Figure (21)

They indicate that the environment where they lived was a hot and rainy tropical environment.

■ Coral

Figure (22)

They indicate that the environment where they lived was clear, warm and shallow seas.

Exercise (2)

How can you infer from the presence of certain fossils in an area to know its past climate?

3 Studying life evolution

Studying the fossil record showed that life started first in sea, then established on land and organisms evolved a ways from simple to complicated higher forms. Algae preceded mosses and ferns. Angiosperms appeared before gymnosperms. Invertebrates such as corals and mollusks with shells appeared before vertebrates. The first vertebrate to appear was the fish, followed by amphibians and reptiles and finally birds and mammals appeared together after the reptiles.



Amphibian fossils linking between reptiles and birds

LESSON 1

Exercise (3)

Arrange the following fossils according to their appearance on the life stage

Algae Marine Amphibian Reptile Mammal

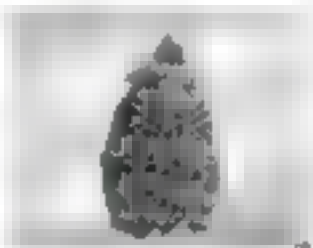
4 Petroleum exploration

When searching for petroleum, geologists take samples from the rocks of the exploratory wells. These sample are studied microscopically. If they contain microfossils like foraminifera (Fig. 24) and radiolarians (Fig. 25), this could be a good indication of the age of the rocks from which they were taken, and the suitable conditions for petroleum formation.

Foraminifera



Radiolarians
(Figure 25)





A case for discussion The geological heritage

Abu Risha Area in 6th October Governorate is considered an educational field for geology students as it is rich in layers and fossils from the cretaceous age which are rare in North Egypt. However, heavy construction projects are carried out there. Guided by your teacher discuss with your classmates this issue taking into account the following questions.

- ❑ 1) How can we protect the geological heritage?
- ❑ 2) How can we use the geological heritage?
- ❑ 3) What would you do if you came across a valuable fossil?
- ❑ 4) What are the benefits of the geological heritage?

Lesson summary

Geological Heritage

Types and ways of formation	Importance
(1) Fossil of a complete body	1) Age determination of sedimentary rocks
(2) Cast	2) Figuring out paleoenvironment
(3) Mold	3) Studying life evolution
(4) Petrified fossils	4) Petroleum exploration

- ❑ **Fossils:** Are remains or traces of organisms that lived in the past and were preserved in sedimentary rocks.
- ❑ **Index fossils:** indicate the age of the sedimentary rocks in which they are found.
- ❑ **Fish** is first vertebrate to appear followed by amphibians, then reptiles and finally birds and mammals appeared together.

LESSON 1



Pre-reading and Background

1 Write the scientific name of the following structures

Remains of old organisms that lived in the past for a certain period and then became extinct.

()

Replacing part by part the wood material of trees by silica to form petrified woods.

()

2 Complete the following phrases

Archaeopteryx represents the link between _____ and _____

Fossils are used in _____ explanation and determining the age of _____

3 Choose the correct answer by writing the letter

1) _____ is an example of microfossil.

Mammals Fossils Foraminifera Archaeopteryx

Complete fossils of insects are found preserved in _____

ammonites / amber / igneous rocks / ambergris

4 Match the fossil to the correct rock type

(1) Coral fossil

(2) Nautilus fossil

5 What is the difference between ?

(1) Trace Cast and Mold

(2) Cast and Mold

6 Give reasons for

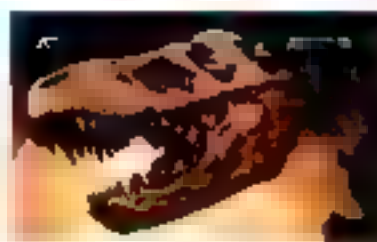
(1) Naming the petrified forests with wood mountain.

El-Mokattam's mountain was once a sea floor more than 35 million years ago.

7 Match the fossils with the descriptions and state their uses.



1



2



3



4



5



6

8 Match the fossils with the descriptions and state their uses.

9 Complete the table.

Your shoe was casted on a wooden mold resembling the shape of the foot.
Mention as many types of molds as you can that are being used in different purposes around you.



Activity

Consult your teacher about the suggestion of making a trip to Gebel El-Mokattam to collect samples of limestone rocks that contain fossils of nummulites to decorate your class or keep them in the museum of the science society of your school.

Lesson 2

Extinction

Second lesson :

Aims of the lesson

- 1 Identify the concept of extinction.
- 2 From the fossils, infer the extinction of surviving organisms
- 3 Identify the factors which lead to the extinction of some living organisms
- 4 Give examples for some extinct species and those are threatened with extinction
- 5 Illustrates the effect of extinction in the ecological balance
- 6 Mention the living organisms threatened by extinction
- 7 Deal in conscious with the environment according to his appreciation of the importance of natural life
- 8 Appreciate the importance of the living organisms in biological balance
- 9 Deal gently with living organisms
- 10 Appreciate the effort of scientists in protection of living organisms
- 11 Appreciate the effort of government in protection of living organisms

Elements of the lesson

- 1 Concept of extinction
- 2 Factors leads to the extinction of species.
- 3 Types of extinction and species threatened extinction
- 4 Effect of the extinction on the ecological balance
- 5 Ways of protect living organisms

Included cases

- | | |
|------------------------------------|---------------------------|
| 1 Extinction | 2 Environmental pollution |
| 3 Prevention of cruelty to animals | 4 Ecological equilibrium |

Extinction:

From your previous study you know that the living organisms are always in case of equilibrium. The number of certain kind of the organisms does not exceeds the number of another species. The continuous decrease in number of other species without compensation of this decrease in number as a result the death of all individuals of this species which known as extinction.

Extinction - The continuous decrease in the numbers of living organisms without compensating this decrease death of all individuals in each species.



Figure (1)
Fish & small



Figure (2)
Dinosaur & bird



Figure (3)
Archaeopteryx fossil

Reasons of extinction:

Many scientists attributed macro extinction which many living organisms lived on earth exposed to take extinction of dinosaurs due to occurrence of big disasters like collision of meteors with earth, violent earth movements, exposure of earth to long ice age or as a result of toxic gases which evolved from volcanoes and many other factors.

While other scientists attributed recent extinction due to human interference of human in environment like destruction of the original habitat of the living organisms, overgrazing, pollution, climatic changes resulted from industrial activities of man and natural disasters (discuss with your teacher and colleagues how these factors leads to extinction of living organisms).

Extinct organisms and their extinction in the environment:

From the famous extinct living organisms in ancient periods of dinosaurs, Mammoth (the grand father of recent elephant) and recent extinct animals such as Dodo bird, Quagga and others.

LESSON 2



Search on the web about living organisms which recently extincted and what have been extirpated from Egyptian habitats. then discuss it with your teacher.



Figure (4)
Rhinoceros



Figure (5)
Mammoth



Figure (6)
Bald eagle



Figure (7)
Quagga

There are more than five thousand kinds of living organisms threatened with extinction like Rhinoceros, Panda bear, bald eagle, and from the Egyptian environment: Bush bird, Barbary sheep, Arno, and poppyas Plant.

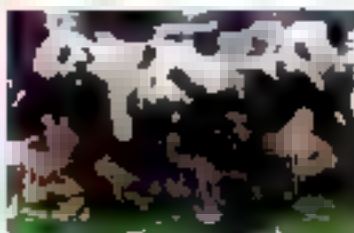


Figure (8)
Polar bear

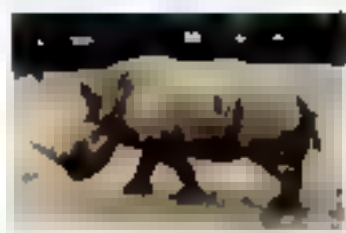


Figure (9)
Rhinoceros

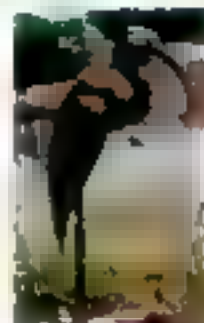


Figure (10)
Heron

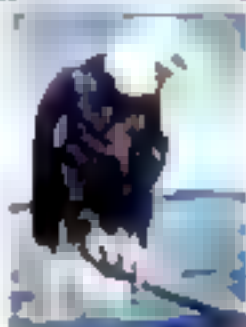


Figure (11)
Lion



Figure (12)
Barbary sheep
(Arui)

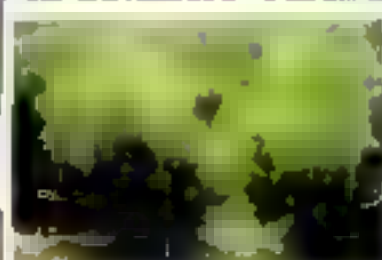


Figure (13)
Papyrus plant

Effect of extinction on the ecological balance



Study the food chain in figure (14) and observe how the extinction of an organism across the food chain and then answer the questions that are given to you by book page. You put a smile face on it.

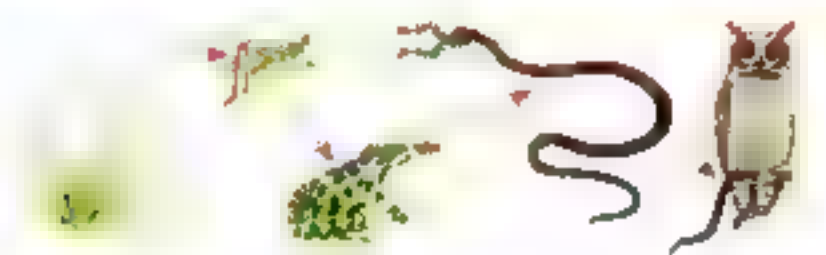


Figure (14) Food chain

LESSON 2

In the food chain, the energy transfers from producers to consumers.

Each living organism has a role in transferring energy in the pathway of the food chain.

In case of absence of one of the living organisms, the role of this living organism stops which affects on the other members of the food chain or on the food web (group of food chains connected with each other).

At the extinction of one species or more from balanced ecosystem, some gaps occurred in the pathway of energy inside this system which leads to a disturbance in the balanced ecosystem and some times its destruction.

The ecosystems are different from each other as a result of the effect of extinction on it. The simple ecosystem (less number of species) is affected strongly at the absence of one species found in it due to absence of a substitute which compensate its absence and play its role as in the desert ecosystem [Figure (15)].

While in the complex ecosystem (large number of species) it does not much affected by the absence of a species of a living organism found in it due to the presence of many substitution which can compensate its absence as in the ecosystem of tropical ecosystem [Figure (16)].

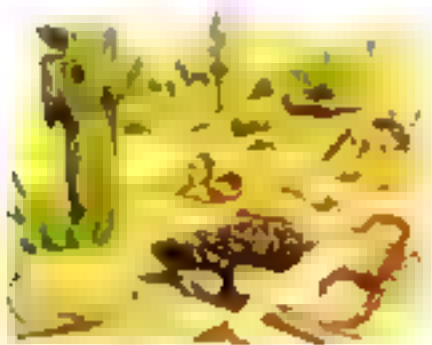


Figure (15)
Desert ecosystem
ecosystem with less
number of species (few kinds)



Figure (16)
Tropical forest ecosystem
Complex ecosystem (many kinds)

Ways of protection of living organisms from extinction

It was necessary for the scientists to think in ways of protection of species endangered by extinction to keep the ecological balance and so the ecological systems from destruction. From these methods:

- ↑ Put laws which regulate the process of hunting of living organisms especially the rare animals or that threatened with extinction.



Figure (17)
Ures bear

- 2 Increase the ecological awareness of the importance of the preservation of the natural life which guarantee the continuity of human life
- 3 Breeding and increasing the endangered species and re-habitation in its original environments
- 4 Establishing genes banks for the endangered species
- 5 Establishing of natural protectorates to preserve the endangered species with extinction

Natural protectorates

are safe places established to protect endangered species in their natural places where suitable conditions are available for their growth and reproduction away from their natural enemies. From these protectorates. Hoge stone in united states of america, where the grey bear is protected and the Panda bear protectorate in northeast of china to protect the Panda bear.

In Egypt Ras Mohamed protectorate had been established in 1983 in south Sinai as the first protectorate in egypt to preserve some rare species of coral reefs and colored fish and wadi El Rayan protectorate in luxor which contains wadi El hetan (Wheals val) that contains skeletons of wheals fossils that are dated to be as old as 40 million years.



Figure (18)

Wadi El Rayan protectorate (shaped as a chin)

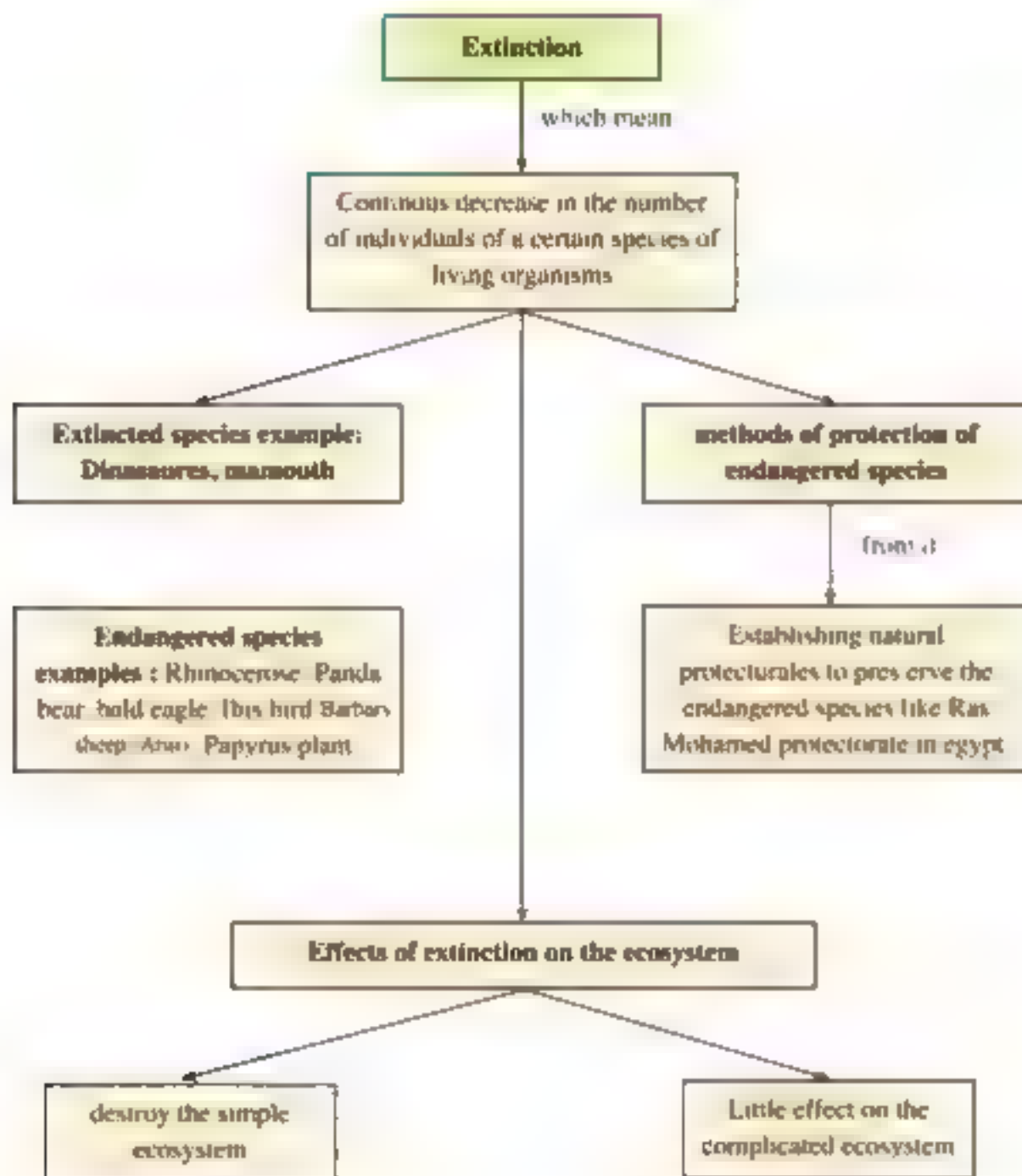


Figure (19)

Wadi El Rayan

Enrichment information () :
 Number of natural protectorates that had been established according to the law (number 102 year 1983) about 30 natural protectorates till 2012 which found on a total 15% of total area of egypt

Summary of the lesson





1) Write a paragraph about the following:

indicates(s) extinction

(fossils / Protectorates / Evolution / Ecological equilibrium)

protectorate is the first established natural protectorate in Egypt

(Saint Catherine / Ras Mohamed / Wadi Hetan / Petrified forest)

2) Write a paragraph about the following:

The death of a / members of species of living organisms.

()

Safe places established to protect endangered species.

()

3) Write a paragraph about the following:

4) Write a paragraph about the following:

Simple ecosystem

Complicated ecosystem

5) Match what you learned about the following:

1) Ras Mohamed protectorate

2) Wadi Hetan area.

6) Complete the following table with the information you learned:

1) Dodo / Quagga / Bald eagle / Mammoth

2) Panda / Rhinoceros / Quagga / Bald eagle

7) Give reasons for

LESSON 2

The desert ecosystem is significantly affected by the absence of one of its species

Unit Revision

1 Choose the correct answer from the words in brackets.

Fossils are often found in rocks (metamorphic / sedimentary / volcanic / igneous)

4) All of the following are endangered species except giraffe
(panda / bald eagle / quagga / rhinoceros)

5) All of the following are natural disasters that threaten the living organisms except
(floods / volcanoes / drought waves / global warming)

2 Match the words with their meanings.

- ☐ Fossil
- ☐ Index fossil
- ☐ Natural protectates

3 Fill in the gaps with the words in brackets.

- 1) The first discovered fossils of dinosaurs were found preserved in amber.
- 2) Fossils indicate that they lived in a cold environment.
- 3) Destroying the habitat is one of the actors that contribute to species adaptation.

4 Write the words in the correct order.










5 Give reasons for

- 1) Petrified woods are considered from fossils although they look like rocks.
- 2) Fossils are important in petroleum exploration.
- 3) The simple ecosystem is significantly affected by the absence of one of its species.

6 Write the words in the correct order.

- 1 Wax Museum statues in Helwan
- 2 Cubes of ice
- 3 Models of clothes shows

Links for 2nd prep.(1st Term)

Unit	Lesson	Content of link	QR code
One	Periodicity of elements and their properties	Metals and nonmetals	
	Water	The importance of water for life on Earth	
		The molecular structure of water	
		The chemistry of water	
Two	Atmospheric layers	Atmosphere	
		Atmospheric layers	
	Ozone Layer	Green house Effect	
Three	Fossils	Amazing fossils	
	Extinction	Extinction	

قائمة المراجع المستخدمة في تأليف الكتاب

المراجع العربية

- (١) موسوعة المشاهدة العلمية (الكيمياء) - أحمد شفيق الخطيب - مكتبة لبنان ناشرون
- (٢) القانون العظيم في الكيمياء - د. تريفونوف - دار مير للطباعة والنشر
- (٣) الموسوعة العلمية المعاصرة - أحمد شفيق الخطيب - دار مير للطباعة والنشر
- (٤) الأرض تدافع عن نفسها (اللاء) - باسيلي جرات - مكتبة الأسرة
- (٥) دليل استخدام معامل العلوم المتطورة للمرحلة الإعدادية - وزارة التربية والتعليم
- (٦) الكيمياء في خدمة الإنسان - رولاند هانسون - الهيئة المصرية العامة للكتاب
- (٧) التلوث البيئي وأثره على صحة الإنسان - د. محمد السيد أرمناؤوط - مكتبة الأسرة
- (٨) قصص وطرائف عن الفلزات - ترجمة عيسى مسوح - دار مير للطباعة والنشر
- (٩) سلسلة ألفا العلمية (الأحماض والمواصفات) - نيكولا يازير - مكتبة الميكان
- (١٠) بيتنا مستقبلاً (أزمة المناخ) - أكاديميا
- (١١) المناخ والطقس - إبراهيم طمس - دار الشرق العربي
- (١٢) السلامة من الكوارث الطبيعية - جمال صالح - دار الشروق
- (١٣) موسوعة الأجيال (الطبيعة) - الأجيال للترجمة والنشر
- (١٤) استكشف العالم والكون (الغابات) - مكتبة لبنان ناشرون
- (١٥) موسوعة الأرض البسيطة (الغابات) - مكتبة لبنان ناشرون

المراجع الأجنبية

- (1) HOLT Chemistry - HOLT RINEHART WINSTON
- (2) Chemistry - J A Hunt and A sykes - Longman
- (3) Chemistry (PRINCIPLES and REACTIONS) - Harcourt
- (4) Chemistry - ZUMDAHL ZUMDAHL - HOUGHTON MIFFLIN
- (5) KEY SCIENCE (Chemistry) - Eileen Ramsden - Stanley Thornes
- (6) ASTRONOMY - John D. Fix - M Mesby
- (7) Environmental GEOLOGY - Carla - WCB
- (8) BIOLOGY (PRINCIPLES & EXPLORATIONS) - HOLT RINEHART WINSTON
- (9) BIOLOGY (The unity and Diversity of life) - Wads Worth

عدد صفحات الكتاب	١٠٤ صفحة بالغلاف
المتن	٨٠ جرام $\frac{1}{8}$ ٥٧ X ٨٢
الغلاف	كوشية ٢٠٠ جرام
الطباعة	اللون للمتن واللون للغلاف
رقم الكتاب	٩١٤/١٠/١٥/١١/٢/٥٣

جميع حقوق الطبع محفوظة لوزارة التربية والتعليم
داخل جمهورية مصر العربية

